

# AGRICULTURAL CHEMICALS

## In This Issue:

A Visit to  
Boyce Thompson

•  
Changing Technology  
in Fertilizer Field

•  
Legal Aspects of the  
Pesticide Industry

•  
A Tour of CFA  
Member Plants

•  
Cost Accounting for the  
Pesticide Manufacturer

•  
Borate-Chlorate Herbicides

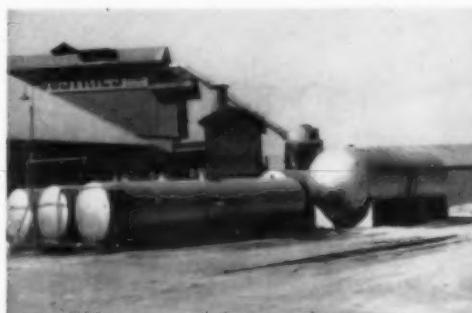
•  
Phytopaths Discuss  
Antibiotics

•  
NFA to White Sulphur

•  
Firman Bear Retires

•  
APFC Holds 9th Conference

•  
Hercules New AgLab





BESTING POWER...THAT'S THE THING!

**DDT**

**ALDRIN**  
**DISLDRIN**

**MALATHION**

**B H C**

**ROTELONE**

**PYRETHRUM**

*Available in all  
formulations for  
Pesticide Manufacturers*

For the household

and Industrial Fields

Dust Concentrates — Wettable Powders —

Emulsions — Oil Soluble Concentrates

Aerosols

## **John Powell & Company**

Division of Mathieson Chemical Corporation

**One Park Avenue, New York 16, N.Y.**

Sales Offices: Philadelphia • Pittsburgh • Chicago •

Fort Worth • Omaha • San Francisco • Atlanta

Representatives in Principal Cities of the World

*LOOK TO POWELL...FOR CONSISTENT, TROUBLE-FREE QUALITY*



## ***Population, Food and Fibre***

Last year the population of the United States increased by almost a quarter of a million people every month.

This rapid acceleration of our population growth calls for greater productivity of food and fibre.

Potash Company of America, around the clock producers of unexcelled Red Muriate of Potash, is assisting our farmers produce more on smaller acreage to meet this population growth.

### ***POTASH COMPANY of AMERICA*** ***Carlsbad, New Mexico***

*General Sales Office . . . 1625 Eye Street, N. W., Washington, D. C.  
Midwestern Sales Office . . . First National Bank Bldg., Peoria, Ill.  
Southern Sales Office . . . Candler Building, Atlanta, Ga.*



## Bad news for him... good news for you



### *Just Off Press...*

*...the current issue of Attaclay Pesticide Digest, discussing various aspects of pesticide processing. Write for your copy, and future Digests as published.*



Could it be this worried army worm is reading his own death warrant in the Attaclay Pesticide Digest? Oh, well . . . his hard luck is your good fortune.

The article—so disturbing to the worm—tells how Attaclay's over-all efficiency and flexibility give you *maximum production of dust bases and wettable powders*. Attaclay is the formulator's star performer when the rush season is on . . . when men and equipment often are asked for a production rate that's far in excess of plant capacities.

Attaclay gives you a big margin in sorptivity to get the most out of reduction mills . . . cycle times in ribbon blenders are speeded up . . . and the

milling or grinding operation following liquid impregnation goes much faster and easier. This same sorptive capacity keeps dusts on the double-quick through conveyors, hoppers, chutes and packaging machines.

Attaclay's efficiency extends to the full range of synthetic organic pesticide chemicals. With only *one* across-the-board carrier and diluent to stock, you save time, trouble, and money in ordering, warehousing, scheduling, and handling.

Our suggestion! Depend on Attaclay to keep your plant producing premium products at speediest rate. We're pleased to offer large free samples and technical help.

**ATTAPULGUS MINERALS & CHEMICALS CORPORATION**  
DEPT. P, 210 WEST WASHINGTON SQUARE, PHILADELPHIA 5, PA.

AGRICULTURAL CHEMICALS

# AGRICULTURAL CHEMICALS



A Monthly Magazine  
For the Trade

WAYNE E. DORLAND  
*Editor*

JOHN A. NICHOLSON  
*Advertising Manager*

Editorial Advisory  
Board . . .

DR. ALVIN J. COX  
Palo Alto, Calif.

LEA S. HITCHNER  
Washington, D. C.

DR. S. E. A. MCCALLAN  
Yonkers, N. Y.

DR. CHARLES E. PALM  
Ithaca, N. Y.

DR. COLIN W. WHITTAKER  
Washington, D. C.



## This Month's Cover

Plants of several members of the California Fertilizer Association. Starting at the top, left to right: Sunland Industries, Inc., Fresno; Fresno Agricultural Chemical Co., Fresno; C. H. Haas Co., Ceres; Growers Fertilizer Co., Stockton; Modern-Ag Crop Service, Fresno; Newell & Co., Lancaster; Nelson Laboratories, Stockton, and California Spray-Chemical Corp., Lindsay.

MAY  
Vol. 9

1954  
No. 5

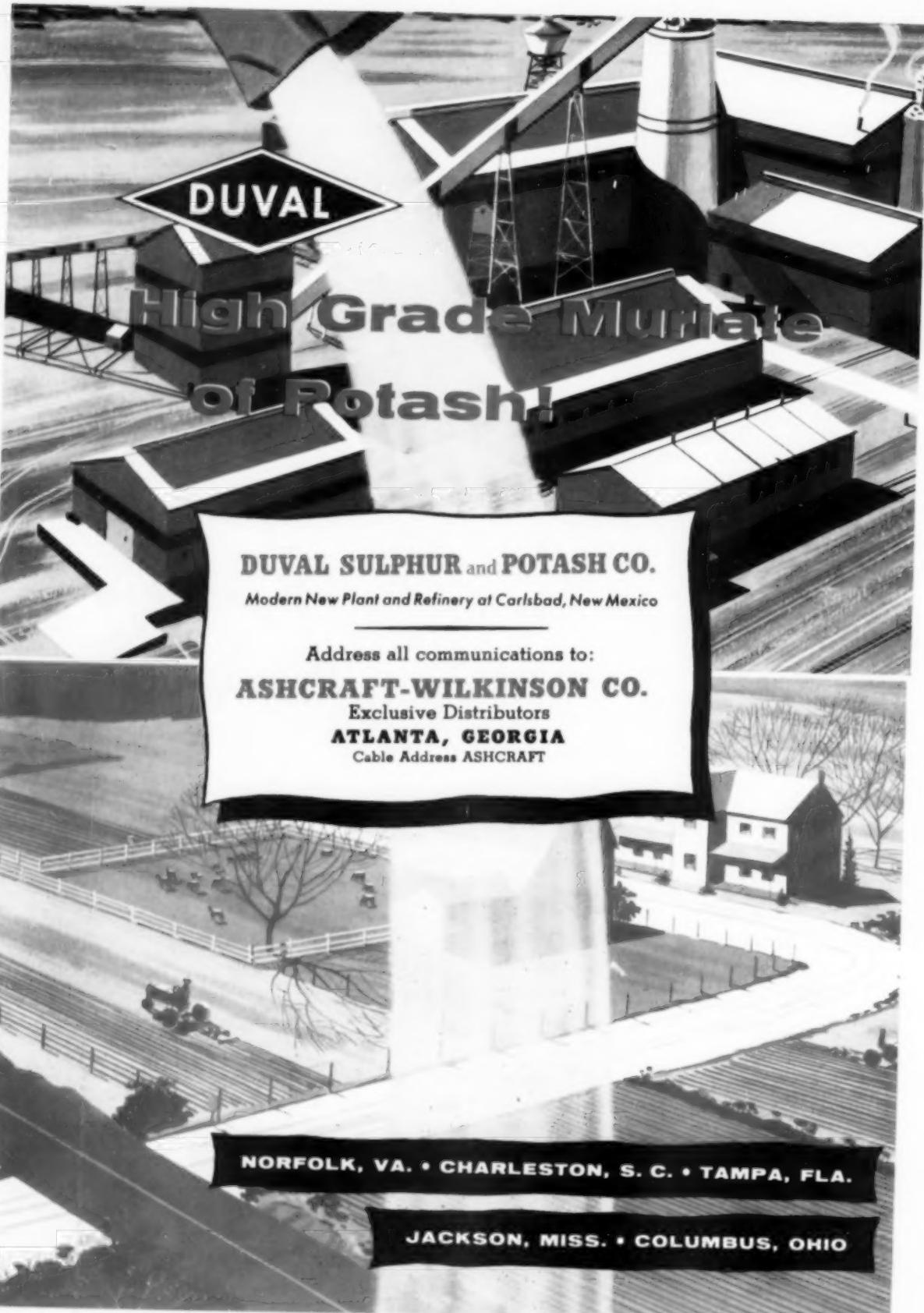
## In This Issue:

Industry Meeting Calendar .....	8
A Visit to Boyce Thompson Institute .....	34
The Changing Technology of the Fertilizer Industry .....	37
<i>By F. A. Retske, G. F. Sachse and R. B. Filbert, Jr.</i>	
Legal Aspects in Marketing Agricultural Chemicals .....	41
<i>By John D. Conner</i>	
Soil Studies Reviewed .....	43
<i>By H. H. Slatson</i>	
California Fertilizer Association Membership (Part 2) .....	44
Cost Accounting Practices in the Agricultural Chemicals Industry .....	48
<i>By Wilson T. Seney</i>	
Evaluation of Borate and Chlorate Herbicides .....	50
<i>By J. D. Stone, and L. M. Stahler</i>	
Potomac Division American Phytopaths Meets .....	54
<i>By Paul Miller</i>	
Firman E. Bear Retires .....	58
The Listening Post .....	61
<i>By Kelvin Dorward and Paul R. Miller</i>	
Washington Report .....	64
<i>By Donald G. Lerch</i>	
Technical Section .....	68
Hercules Dedicates Agricultural Laboratory .....	80
Industry News .....	83
'53-'54 Fertilizer Outlook .....	98
Classified Advertising .....	133
Advertisers' Index .....	137
Tale Ends .....	138

## AGRICULTURAL CHEMICALS

**Subscription Rates:** One year, United States, \$3.00; Canada and Pan American countries, \$4.00; Foreign, \$7.00. Published monthly on the 15th by Industry Publications, Inc. Wayne E. Dorland, President; Ira P. MacNair, Secretary-Treasurer. Publication office, 123 Market Place, Baltimore 2, Md. Advertising and editorial office 175 Fifth Ave., New York 10, New York — Chicago Office, 333 N. Michigan Blvd. Advertising rates made known on application. Closing date for copy—10th of the month preceding month of issue.

Entered as second-class matter November 4, 1949, at the Post Office at Baltimore, Md., under the Act of March 3, 1879.



all's well  
that  
ends well!

THIS TITLE of a Shakespearean comedy may well apply to the shipment of commodities in Multiwalls which prevent the tragedy of waste in transit.

In designing Raymond Multiwalls we first determine, through sound engineering methods, all stresses caused by the product to be shipped and then produce the sack that will assure its safe delivery by any type of carrier.

Safe construction (with special protective features when required); savings in production costs wherever practical; clean, sharp, legible printing; and deliveries *when promised*.

Call in a Raymond man. Maybe it's time to review *your* package needs.

THE RAYMOND BAG COMPANY,  
Middletown, Ohio. Phone 2-5461.

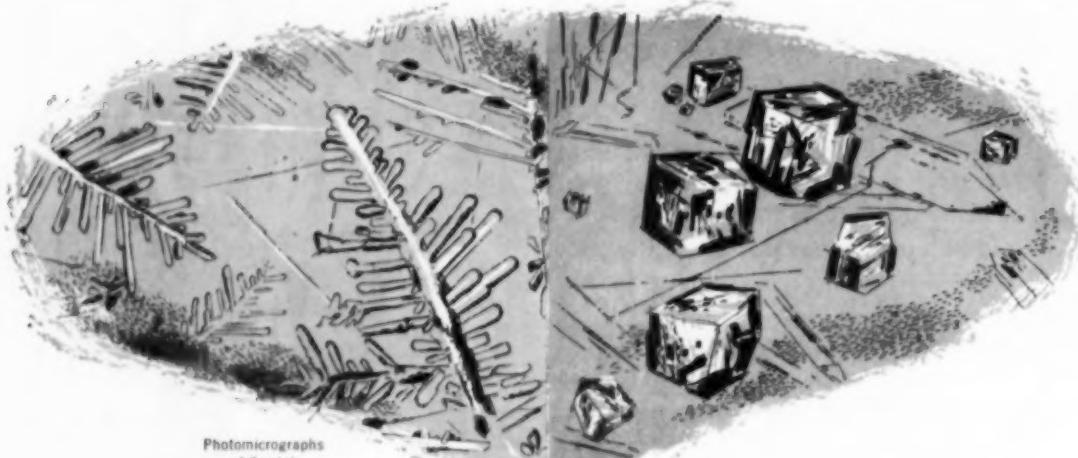


**Raymond**  
**MULTIWALL PAPER  
SHIPPING SACKS**

May 4-6—Fertilizer Section, North Carolina, Annual Safety Conf., Sir Walter Hotel, Raleigh.  
 May 4-6—Green Pastures Spring Tour, State of Kentucky, Jefferson, Bullitt, Meade, Breckenridge and Hopkins counties.  
 May 6-8—Fertilizer Section, Governor's Safety Conference, Lord Baltimore Hotel, Baltimore, Md.  
 May 21—Fertilizer Section, Va. Annual State-wide Safety Conf., Monticello Hotel, Norfolk.  
 May 23-25—Chemical Specialties Manufacturers Assn., mid-year meeting, Netherlands Plaza Hotel, Cincinnati, O.  
 June 3-5—Manufacturing Chemists Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.  
 June 10-13—American Plant Food Council, The Homestead, Hot Springs, Va.

## Meeting Calendar

- June 13—Executive Committee, Fertilizer Section, National Safety Council, White Sulphur Springs, W. Va.  
 June 14-16—National Fertilizer Association, Greenbrier Hotel, White Sulphur Springs, W. Va.  
 June 21-22—Assn. Southern Feed & Fert. Control Officials, Skirvin Hotel, Oklahoma City, Okla.  
 June 22-24—Pacific Slope Branch, E.S.A., Pilot Butte Inn, Bend, Ore.  
 June 28-29—North Central Phytopathological Meeting, Ames, Ia.  
 July 1-4—Plant Food Producers of Canada, Manoir Richelieu, Murray Bay, Quebec.  
 July 20-22—Pac. Northwest Regional Fert. Conf., Klamath Falls, Ore.  
 July 21-23—Eighth Annual Beltwide Cotton Mechanization Conference, Little Rock, Ark.  
 July 22-23—Southwest Fertilizer Conference, Buckaneer Hotel, Galveston, Tex.  
 Aug. 11—Annual Kentucky Fertilizer Conference, Guignol Theater, University of Kentucky, Lexington.  
 August 25-27—American Phytopathological Society, 46th Annual Meeting, Estes Park, Colo.  
 Sept. 8-10—National Agricultural Chemicals Association, Spring Lake, N. J.  
 Oct. 6-7—Fifth Annual Convention, Pacific Northwest Plant Food Association, Sun Valley, Ida.  
 Oct. 18-19—Fertilizer Section, NSC, Chicago, Ill.  
 Nov. 15-16—California Fertilizer Association, del Coronado Hotel, Coronado, Cal.



## How URANA\* solutions reduce caking and secondary bag set

The usual mixed fertilizers contain ammonium chloride salts resulting from reaction of ammonium salts with potassium chloride. These fern-like or needle-shaped crystals tend to bind together, causing caking of the fertilizer at the factory and in the bag.

When URANA 15 (15% Urea) or URANA 9 (9.25% Urea) Solution is used in ammoniation, the urea makes the ammonium chloride form cube-like crystals, with much less binding effect. This means less caking and set, better fertilizer condition, and often a reduction in costs.

This is only one of several advantages obtained from ammoniating with URANA Solutions. For other important aids developed through Nitrogen Division research, consult one of our technical servicemen. Their help is free to our customers.

\*Trade Mark



**Arcadian®**

PRODUCTS FOR  
PROFITABLE FARMING

Nitrogen Solutions  
(Nitroana® and Urana\*)

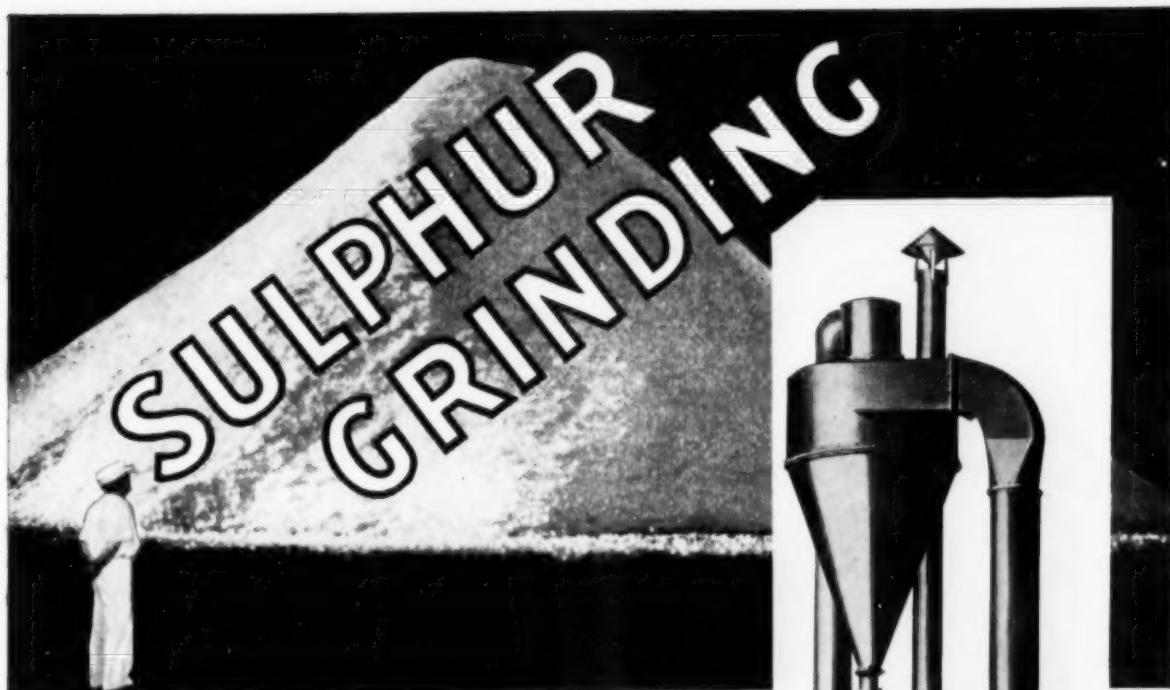
AMERICAN  
Nitrate of Soda

A-N-L®  
Nitrogen Fertilizer

Urea Products

Sulphate of Ammonia

New York 6, N. Y. • Richmond 19, Va. • Ironton, Ohio • Hopewell, Va. • Atlanta 3, Ga. • Columbia 1, S. C. • Omaha, Neb. • San Francisco 3, Calif.



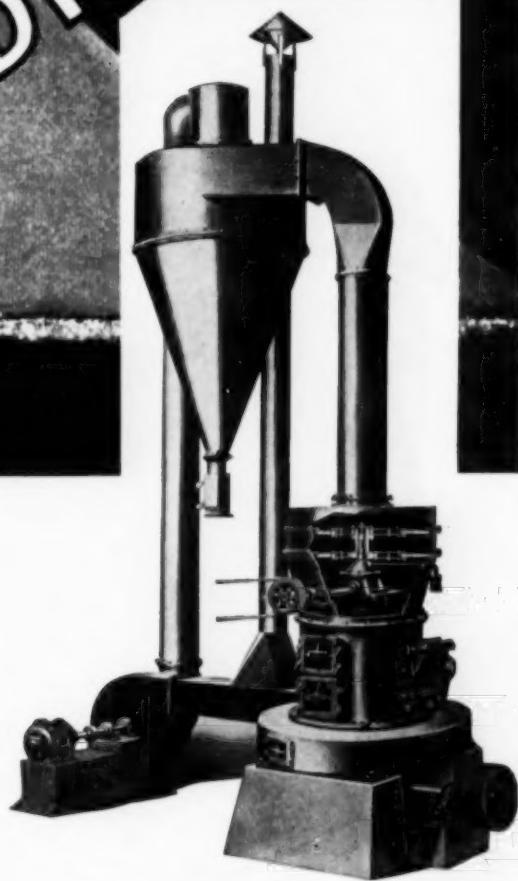
## ... IS A JOB FOR RAYMOND ROLLER MILLS

Uniform product quality, plus economy and safety in operation, are advantages you are assured when grinding sulphur or sulphur-bearing insecticides on Raymond Whizzer-type Roller Mills.

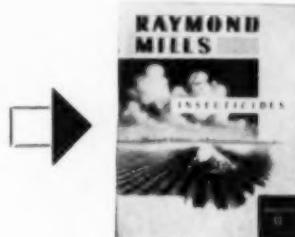
These machines are equipped with ball-bearing journals, especially designed for sulphur grinding, and the entire system is blanketed with CO<sub>2</sub> inert gas.

Electrically welded piping and flanges, double type bronze rotary discharge valves and heavy gauge steel collectors, make the system practically gas-tight and keep air filtration at an absolute minimum. Pressure relief vents are provided.

The operation is clean, dustless and automatic. The slow speed of the grinding elements prevent the sulphur from sticking or overheating. Whizzer air separation assures a premium product with any finenesses available to 99% passing 325 mesh or better. You can produce the finer grades of dusting sulphur, and also other modern insecticide formulations at new low cost.



Raymond High Side Roller Mill equipped with Whizzer Separator as shown in section.



For further details, write for Bulletin #68 which describes the full line of Raymond insecticide grinding mills.

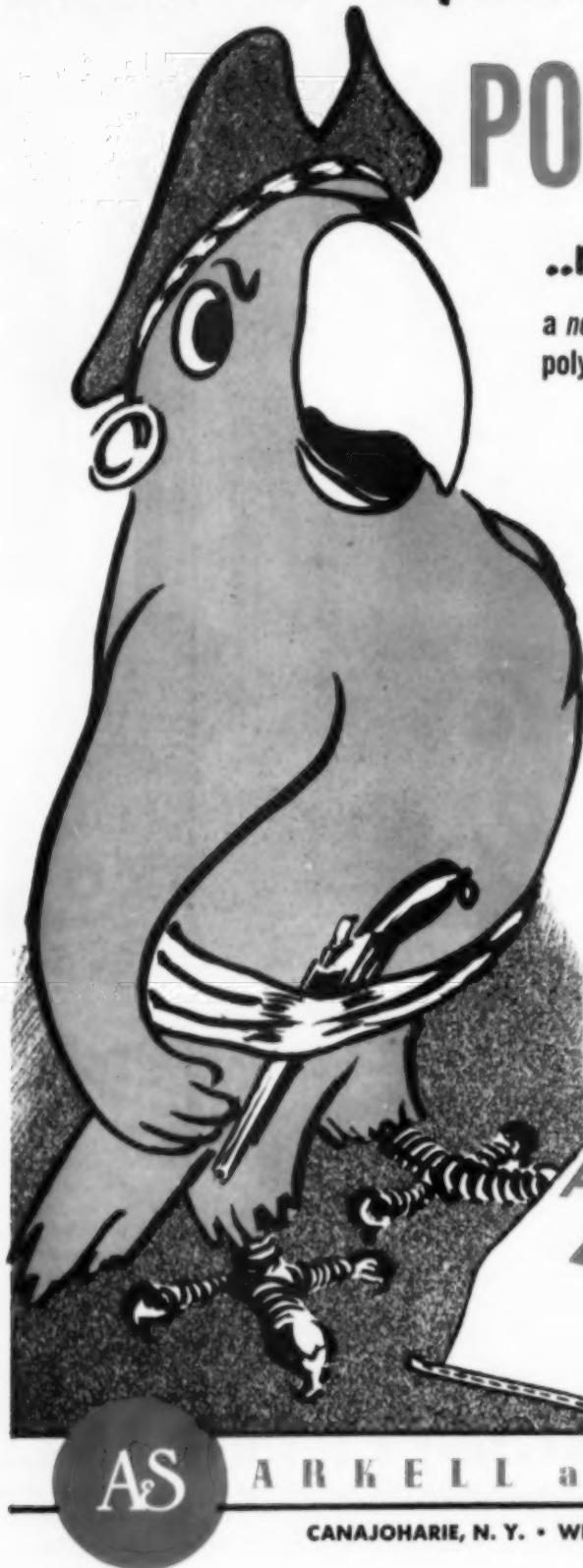
# COMBUSTION ENGINEERING, INC.

*Raymond Division*

1314 NORTH BRANCH ST.,  
CHICAGO 22, ILLINOIS

SALES OFFICES IN  
PRINCIPAL CITIES

# A Lower Cost Replacement for Polyethylene!



## POLY-KOTE BAG

**..new..versatile..protective..**

a new wall for multiwall bags that cost less than polyethylene!

POLY-KOTE is a new product that does the same job as straight polyethylene, BUT at an impressive cost-reduction. POLY-KOTE sheets, developed by Arkell and Smith's Packaging Department, are coated with a combination of polyethylene and wax.

POLY-KOTE is equally acid and alkali resistant as straight polyethylene and is ideally suited for packaging hygroscopic materials — fertilizers, chemicals, resins, dried milk, etc.

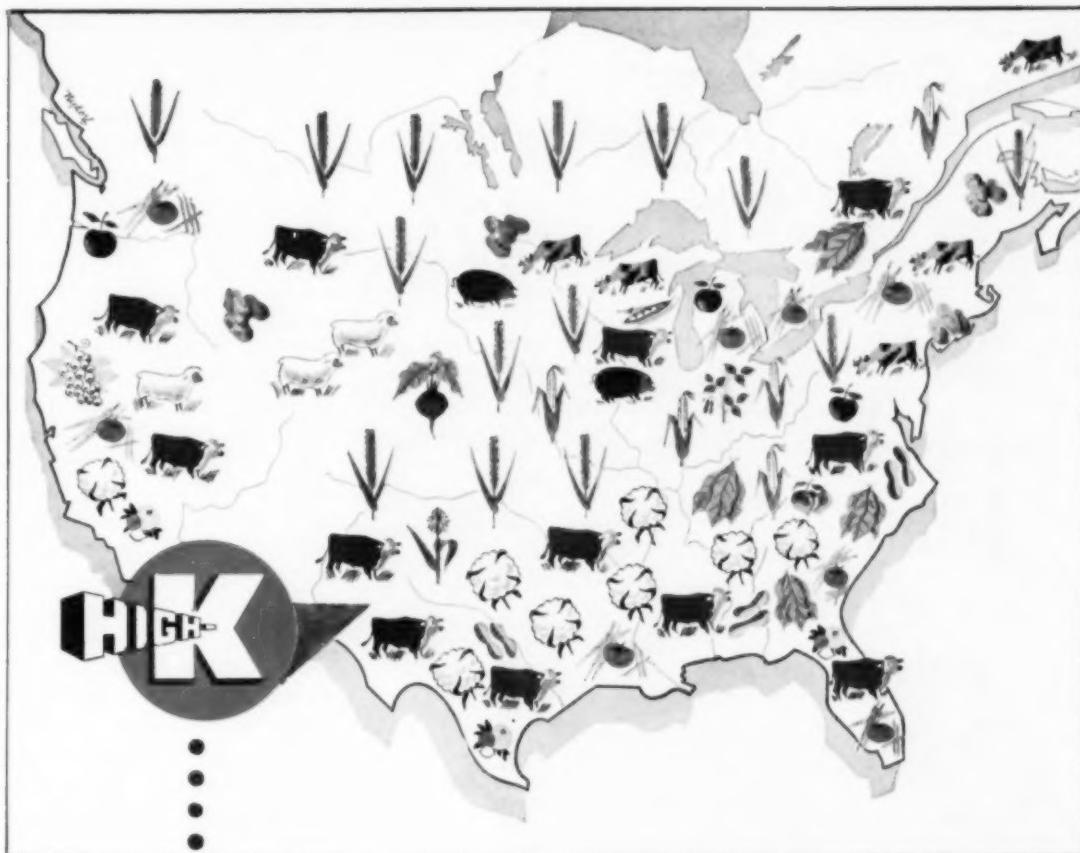
POLY-KOTE provides a moisture barrier equal to straight polyethylene.

Let our 95 years of packaging "know-how" serve you. Our Packaging Engineers will give immediate attention to your specific problems. Learn how POLY-KOTE can efficiently serve you — save money!

KEEPS  
QUALITY  
IN!  
KEEPS  
MOISTURE  
OUT!

ARKELL and SMITHS

CANAJOHARIE, N. Y. • WELLSBURG, W. VA. • MOBILE, ALA.



*Southwest* serves agriculture

- ... by using modern mining facilities and
- up-to-date processes to produce HIGH-K\* Muriate
- of Potash for plant food manufacturers.

**Southwest Potash Corporation**



61 BROADWAY ★ NEW YORK 6, N. Y.

## F.D.A. Clarifies Stand on New Toxicants

C LARIFICATION of its position on what prerequisites should be necessary before new chemicals may be used on food products is contained in a recent letter by Commissioner C. W. Crawford, of FDA, to the editor of the *Journal of the American Medical Association*. In an article in the December 12, 1953 issue of the *Journal*, by Dr. Maurice H. Seevers, a much-quoted paragraph from the testimony of former commissioner P. B. Dunbar (before the Delaney Committee hearings) was

The quotation of what was an extemporaneous statement by Com. Dunbar follows: "I feel that no chemical or no new chemical that is subject to any question as to safety should be employed until its possible injurious effect, both on acute and over a long-time chronic basis, has been shown to be nonexistent. In other words, any chemical that is proposed for use ought to be approved in advance of distribution in the food product to be utterly and completely without the possibility of human injury".

Mr. Crawford indicated that Com. Dunbar, according to the published report of the hearings, used the word "proved" rather than "approved" which gives a different significance to his remarks. He also calls attention to what he describes as a "highly significant" section of Com. Dunbar's subsequent testimony in which he said: "What I think we need is an amendment which we might call the new chemical section, which will make the proponent of a new chemical, the addition of a new chemical, present the same type of convincing proof of safety that is now required in the case of new drugs before interstate commerce is undertaken".

In further clarification of the FDA's stand on permitted use of chemicals in or on foods, Com. Crawford points out that the new drug section requires testing only by "methods reasonably applicable to show whether or not such drug is safe for use" and it is this control principle which FDA favors extending to use of new chemicals in food. Perfection is not envisioned prior to permitting usage, Com. Crawford indicates, in either field.

His statement, he indicates, was made to clarify the record on this point, and to set it straight, and to make sure that FDA is not credited with what he describes as a "non-existent and indefensible policy".

# Tried and Tested Carriers and Diluents

### BARDEN CLAY

The accepted standard for all other diluents.

### SUPREX CLAY

Extra-low screen residue—a premium super-grade carrier for toxicants effecting lower production costs. Recommended for wettable powders and concentrates. Excellent adsorptive and suspension properties.

Improved Dispersion

Higher Mortality

Better Coverage

Greater Uniformity

Better Retention

Maximum Economy

### BARDEN AG CLAY

Similar in properties to Barden; especially for those who can tolerate a higher screen residue.

### SUPREX LG CLAY

Similar to Suprex but with even lower screen residue to permit fastest production time and lowest production cost.

Write  
for your  
free  
working samples.

J. M. HUBER CORPORATION, 100 PARK AVE., N. Y. 17, N. Y.  
One of the World's Largest Clay Producers

HUBER



**Sul-Po-Mag®**  
WATER-SOLUBLE  $(K_2SO_4 \cdot 2MgSO_4)$   
DOUBLE SULFATE OF POTASH-MAGNESIA

**contains soluble magnesium—often called the fourth element!**

Very often, the difference between profitable high yields and costly poor ones is the amount of soluble magnesium available to the crop. This is increasingly apparent each year as the lack of this vital nutrient becomes evident in more and more crop growing areas across the country. That's why soluble magnesium is often called the Fourth Plant Food Element . . . it's that important.

You can supply soluble magnesium economically and conveniently by including Sul-Po-Mag in your mixed fertilizers. You'll have a better product . . . one that dealers can mer-

chandise more effectively . . . you'll have a fertilizer that will make money for farmers. And don't forget . . . results are what determine brand loyalty!

Sul-Po-Mag, produced only by the Potash Division of International, furnishes both magnesium and potash in sulfate form . . . properly balanced and water soluble for immediate availability to the plant. It is supplied in bulk for use in mixed fertilizers and bagged for direct application. So, include Sul-Po-Mag to supply soluble magnesium. Put it in the bag . . . and put it on the bag: Nitrogen, Phosphate, Potash, Magnesium.



MURIATE OF POTASH • SULFATE OF POTASH • SUL-PO-MAG

Mined and Refined at Carlsbad for Fertilizer Manufacturers

Potash Division

**INTERNATIONAL MINERALS & CHEMICAL CORPORATION**

General Offices: 20 North Wacker Drive, Chicago 6



# GRINDING TIME IS MONEY



**YOU CAN SAVE TIME WHEN YOU NEED IT MOST  
WITH PENTECH® SPECIAL TECHNICAL DDT**

During your short, busy manufacturing season time is money! To help you get more production, more profit from the time available, Pennsalt offers PENTECH—the one technical DDT built specifically to suit your compounding needs. Here's why this exclusive Pennsalt development is best for you when the pressure is on.

PENTECH is made by a patented process which reduces the wax-like nature of DDT and makes the particles more friable. It is supplied as a fine granular powder for mixing with a diluent to make dust bases which can then be

further pulverized and extended to field-strength dusts.

Thus PENTECH offers you *lower costs* and *maximum production* through faster grinding and blending; less chance of clogging and greatly reduced requirements for dry ice.

This season, make the very most of your equipment and your time by using PENTECH! For free technical aid on the use of PENTECH, or for detailed product information, contact the Pennsalt Agricultural Chemicals office nearest you.

PENNSYLVANIA SALT MANUFACTURING COMPANY OF WASHINGTON  
Tacoma 1, Wash. Philadelphia 7, Penna.  
Montgomery, Ala. • Bryan, Texas • Portland, Ore.  
Los Angeles and Berkeley, Calif.

**Pennsalt**  
**Chemicals**

ALWAYS SPECIFY → HAMMOND

# MULTI-WALL BAGS

FOR PROMPT SERVICE FROM

THREE STRATEGICALLY LOCATED  
PLANTS

Open Mouth  
Pasted Bottom

Sewn  
Valve Type



Open Mouth  
Sewn Bottom



Pasted  
Valve Type

Representatives in the following cities:  
KANSAS CITY, MO. ATLANTA, GA.  
NEW YORK, N.Y. BLUEFIELD, VA.  
DALLAS, TEXAS CHICAGO, IL.  
LIGONIER, PA. ALEXANDRIA, VA.  
MINNEAPOLIS, MINN. CHARLOTTE, N.C.  
WASHINGTON, D.C. BIRMINGHAM, ALA.

WELLSBURG, W. VA.

CHARLOTTE,  
N.C.

PINE BLUFF, ARK.

We have now moved into our new modern factory at Charlotte, North Carolina—another step in our program of constantly improving service to our customers.

Hammond "personalized service" is more than a slogan. Call our nearest representative.



HAMMOND BAG & PAPER CO.

General Offices: Wellsburg, W. Va.  
Plants in Wellsburg, W. Va., Pine Bluff, Ark.,  
and Charlotte, N.C.

the kernel  
of our  
story...

profits  
from "region-rated"  
soluble fertilizers

with  
**Monsanto**  
phosphates

Using Monsanto's high-purity ingredients for soluble fertilizers you can "region-rate" formulations to meet the specific crop needs of your area.

And this is only one of the many advantages you get with Monsanto's concentrated nutrients. You'll find these dependable compounds require *less bulk storage and handling* since they are highly concentrated. Moreover, they are easy to use in *closely controlled formulations* because of their pure basic ingredients. Couple these features with special customer benefits of easy application, quick availability, low costs and you have a combination that will earn more profits for you.



MONSANTO CHEMICAL  
COMPANY, Inorganic  
Chemicals Division, 1700 South  
Second Street, St. Louis 4, Mo.

Write today for  
your copy of booklet  
"Concentrated  
Water Soluble  
Fertilizers" to





## They'll eat you out of house and home

THE BETTER YOUR COTTON, the more these hungry pests enjoy eating the profit out of it. They'll do it too... unless your spray or dust program is adequate to control them.

That's where dieldrin comes in, with unbeatable killing power on the early season thrips, certain

cutworms and fleahoppers... and the ruinous boll weevil and grasshopper all season long. Dieldrin is deadly to all of them, and just as important, *its lethal action lasts many days*, even in hot, dry, windy areas.

Dieldrin is tops for cotton pest control. It is just as good against

onion thrips, alfalfa weevil larvae, ants, and a host of other insects on many crops.

Technical dieldrin is supplied by Shell Chemical Corporation, and sold under the brand names of leading insecticide manufacturers. See your insecticide dealer.

**SHELL CHEMICAL CORPORATION**

AGRICULTURAL CHEMICALS DIVISION  
P. O. BOX 1617, DENVER 1, COLORADO

Atlanta • Houston • New York • San Francisco • St. Louis • Jackson, Miss.





## make GENERAL CHEMICAL your Source!

Since DDT first appeared as an insecticidal discovery of revolutionary importance, General Chemical has been a major factor in its production. One of the first to supply DDT to our Armed Forces during the war, General Chemical from that time has been delivering tonnage quantities to mixers, suppliers and manufacturers. It's just natural for General Chemical to be in the forefront, for our "know-how" reaches back over half a century—to the earliest days of scientific pest control on agricultural crops!

Today, you can get almost any important base material or toxicant for producing insecticides, fungicides or herbicides—quickly, advantageously, "under one roof," from General.

For your DDT needs—or any of the other toxicants listed below—just write or phone any of General Chemical's offices located from coast to coast.

Agricultural Chemical Department

**GENERAL CHEMICAL DIVISION**  
ALLIED CHEMICAL & DYE CORPORATION  
40 Rector Street, New York 6, N. Y.

Serving Agriculture from Coast to Coast



...everything you need

—in one stop

### FORMULATORS AND DUST MIXERS CHECK THIS LIST!

#### TDE (DDD)

Technical, Flake  
Dust Base (50% TDE)

#### DDT

Technical, Flake or Granular  
Dust Base, 50% & 75%

#### BHC

Technical (15% & 36%  
Gamma)  
Dust Base, 12% Gamma

#### LINDANE

Technical  
Dust Base, 25%, 75%, 95%  
Emulsifiable Concentrate,  
20%  
Oil Concentrate, 20%

#### ORGANIC MITICIDES

GENITE® 883 (p-chlorophenyl  
p-chlorobenzene sulfonate)  
Technical

GENITE 923 (2,4-Dichloro-  
phenyl Ester Benzene  
Sulfonic Acid) technical  
"Aramite" Technical

#### LEAD ARSENATE

Standard  
Astringent  
Basic

#### CALCIUM ARSENATE

Standard  
Low Lime

#### PARATHION

Dust Base, Emulsifiable  
2 & 4 lbs. per gallon

#### FERBAM

Dust Base (76% Ferric  
Dimethyl-Dithiocarbamate)

#### ZIRAM

Dust Base (76% Zinc  
Dimethyl-Dithiocarbamate)

#### WEED KILLERS

2,4-D  
Acid, and Technical Esters

2,4,5-T  
Acid, and Technical Esters

TCA SODIUM SALT  
90% Dry Powder  
50% Liquid Concentrate

#### POTASSIUM CYANATE

Technical  
Weed Killer

#### STA-FRESH®

Sodium Bisulfite  
silage grade  
\*Reg. U. S. Pat. Off.  
General Chemical Trade-Mark

CHEMICAL PROGRESS WEEK • May 17 to 22 • A Better America Through Chemical Progress



## IT'S CHICKEN FEED



MIGRADE MURIATE OF POTASH 62/63% K<sub>2</sub>O  
GRANULAR MURIATE OF POTASH 60% K<sub>2</sub>O MIN.

Southern Sales Office  
Rhodes-Haverty Building, Atlanta, Georgia

MAY, 1954

It's jam-packed with nourishment value that fattens broilers and fryers quickly, and keeps egg production high. Feeds like these are grown in rich, well-fertilized soil.

Potash, a particularly effective component of modern commercial fertilizers, not only enriches the soil, but improves crop resistance to disease, producing healthier crops and larger yields.

In the mixing of these fertilizers, potash produced by the United States Potash Company has two distinct advantages. It has the highest K<sub>2</sub>O content and is free-flowing and non-caking—important factors in fertilizer production.

Potash, as an investment, amounts to hardly more than "chicken feed"—yet pays rich dividends all through the agricultural economy.

**UNITED STATES POTASH COMPANY**  
INCORPORATED      30 ROCKEFELLER PLAZA  
                          NEW YORK 20, N.Y.



a blossoming market  
for profits...

## soluble fertilizers with Monsanto phosphates

More repeat business—that's one of the reasons why concentrated soluble fertilizers are a growing favorite with increasing numbers of fertilizer producers. Customers come back for more because easy-to-use soluble fertilizers can be "region-rated" to the soil needs in scores of localities.

Monsanto's concentrated soluble nutrients also have other important advantages. These dependable compounds require *less bulk storage and handling* because of their high concentration of active plant nutrients. They permit *closely controlled formulation* because of their pure basic ingredients. Equally important, they are available in quantity from an assured source of supply—Monsanto, world's largest producer of elemental phosphorus.

Write today  
for your copy  
of booklet  
"Concentrated Water  
Soluble Fertilizers" to  
MONSANTO CHEMICAL  
COMPANY, Inorganic  
Chemicals Division,  
1700 South Second St.,  
St. Louis 4, Missouri.





## Du Pont **TELVAR W** fills industry's need for a powerful weed killer *...with extra-long residual activity*

Modern industry no longer tolerates the nuisance, fire hazard and general unsightliness of weeds. "Telvar" W kills weeds through their roots. Because it remains effective in the soil for long periods at recommended rates of application, it kills weeds and prevents regrowth. Usually only one application will destroy unwanted vegetation for a full season or longer. Here are the reasons "Telvar" W is tailor-made for industry:

**It is economical.** Just 1 to  $1\frac{1}{2}$  lbs. per 1000 square feet (40 to 60 lbs. per acre) will give a season's control . . . or even longer.

**It saves time and work.** One spray usually does the job . . . repeat applications are seldom necessary. No bulky chemicals or difficult, time-consuming labor are required.

**Fire hazards are reduced** by clearing ground and keeping it free of unwanted vegetation with "Telvar" W. Especially important in storage yards, tank farms and around pipe lines.



**TELVAR W**

TRADE MARK      Weed Killer

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

MAY, 1954

**Makes for operating efficiency** because it cuts maintenance costs, keeps areas clear for work or storage.

**"Telvar" W is easy to use.** It is a wettable powder ready to mix with water.

**It is non-flammable, non-volatile, non-corrosive to metals and low in toxicity to humans and animals.**

On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

*Write for this free booklet  
showing results with "Telvar" W*



Grasselli Chemicals Division  
E. I. du Pont de Nemours & Co. (Inc.)  
Wilmington 98, Delaware, Rm. D-4026

Please send me free booklet on "TELVAR" W

Company name \_\_\_\_\_

Address \_\_\_\_\_

City & State \_\_\_\_\_

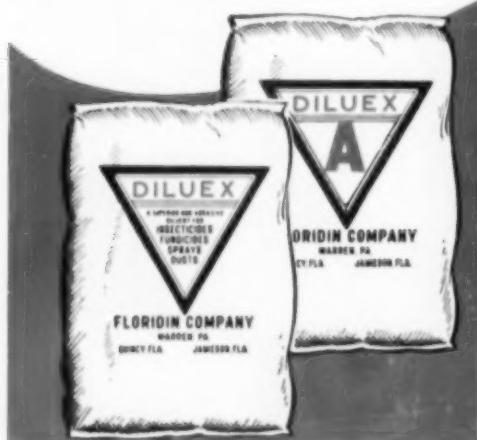
My name \_\_\_\_\_

**DILUDEX... makes**

**MORE PESTICIDE SALES**



**Ask for more data  
and Samples!**



Here is a highly adsorptive Fuller's Earth that can be readily adapted to fit the many formulations required in competitive markets. Improved products insure your customer's satisfaction, resulting in increased sales.

#### GRANULAR PESTICIDE FORMULATIONS

Adsorptive Florex granules offer a superior base for granular soil pesticides, mosquito control formulations and insecticide-fertilizer additives. Available in standard meshes 30/40, 30/60, and 16/30. Special meshes tailored for experimental formulas.

For impregnating liquid toxicants—milling DDT, BHC, or other organics—conditioning blended dusts—the total demand for DILUDEX has multiplied during these years. Production facilities have been greatly enlarged to keep pace. Inquiries and orders will be given prompt attention.

**FLORIDIN COMPANY**  
ADSORBENTS . . . DESICCANTS . . . DILUENTS

Dept. M, 220 Liberty Street, Warren, Pa.

AGRICULTURAL CHEMICALS

# HEPTACHLOR

## in '54

### throughout the Cotton Belt.

1

#### Quick Kill.

You'll see dead and dying boll weevils in the fields within a few hours after treatment with Heptachlor. This fast kill is important because every minute of insect damage reduces crop profit. That's Heptachlor initial control!

2

#### Long Residual Action.

There'll be dead and dying boll weevils in your fields for several days after treatment with Heptachlor. The great killing power of Heptachlor will stay at a high level until the next recommended treatment. That's Heptachlor residual control!

3

#### Easy to Apply.

Any standard spraying or dusting equipment does the job with ease. Heptachlor is simple to handle, and you get better dustability, too, with no harmful residues. That's Heptachlor convenience!

4

#### Economy.

Heptachlor gives effective control until late in the season with as little as four ounces to the acre. Heptachlor will also control cotton flea hoppers, thrips, garden webworms, rapid and tarnished plant bugs and certain cutworms.

ASK YOUR INSECTICIDE DEALER ABOUT HEPTACHLOR TODAY!

**VELSICOL CORPORATION**

Division of Arvey Corporation

General Offices and Laboratories      Foreign Division  
330 East Grand Ave., Chicago 11, Ill.      100 East 42nd St., New York 17, N.Y.

REPRESENTATIVES IN PRINCIPAL CITIES

MAY, 1954





\$1 to \$2 spent on  
**Fertilizer  
Borate**  
(HIGH GRADE)  
can give you an  
extra ton of Alfalfa  
hay per acre...

See for yourself what Fertilizer Borate, with its high boron content, meant to this alfalfa field. Boron, so vital to alfalfa, is also required by other field crops such as clover, sweet corn, tobacco...and most vegetable and fruit crops. This year, invest a few extra pennies per acre in Fertilizer Borate...the low-cost fertilizer grade of borax...to grow better crops!

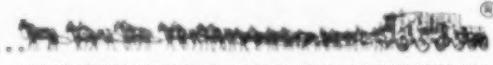
Look for These Symptoms in Alfalfa: Lack of boron causes plants to become puny and dwarfed. Look for yellow or reddened top leaves, stunted, with growing tips rosetted. See close-up photograph in circle for excellent example of boron-starved plant characteristics.

● *Fertilizer Manufacturers—Here's Borax at the Lowest Cost per Unit...It's Fertilizer Borate-High Grade!*

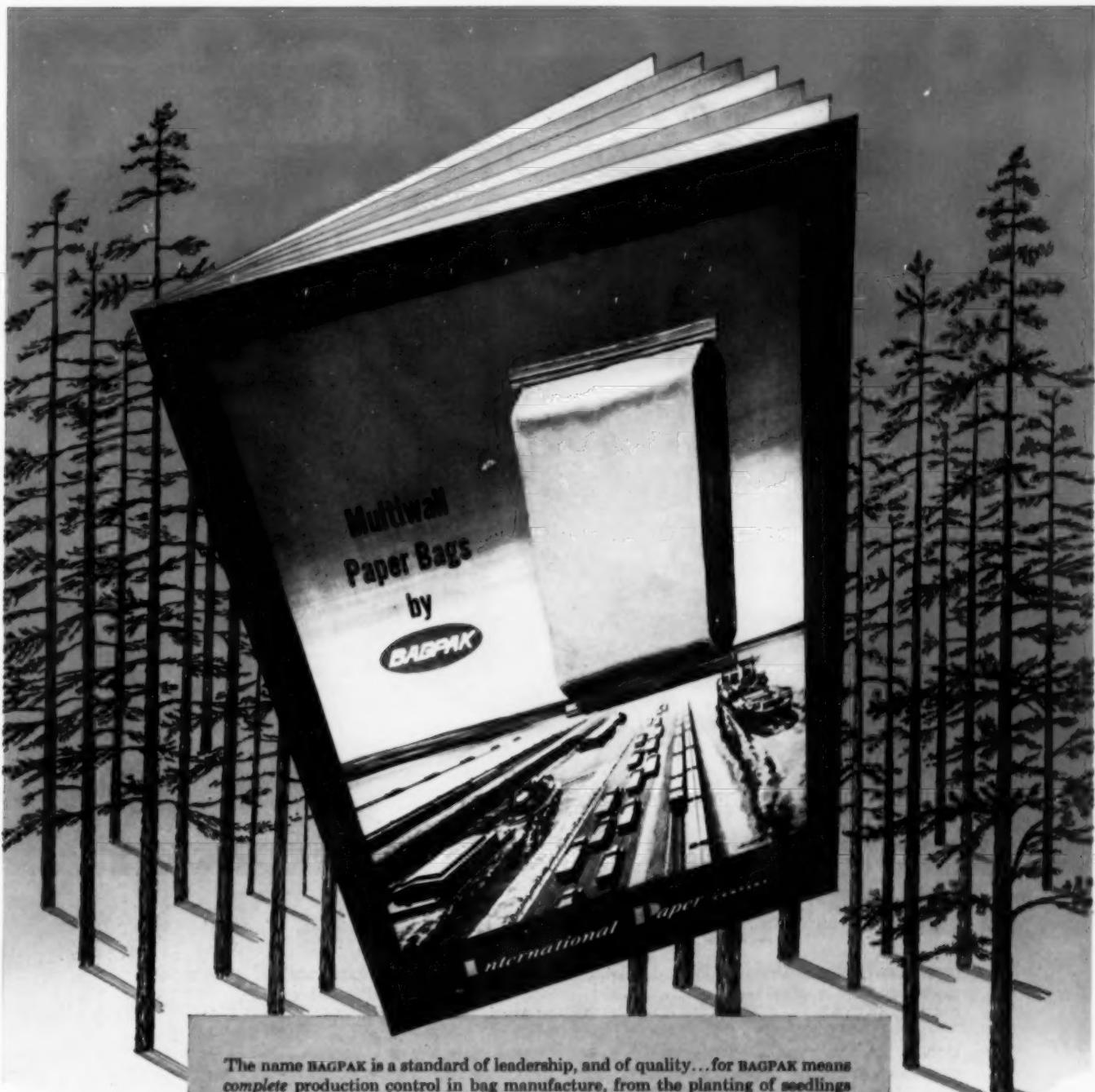
This sodium borate concentrate, developed especially for the fertilizer trade, has higher analysis...approximately 121% borax equivalent. Choice of fine or coarse mesh. Write for Bulletin PF-3!

**PACIFIC COAST BORAX CO.**

DIVISION OF BORAX CONSOLIDATED, LIMITED



MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS



The name BAGPAK is a standard of leadership, and of quality...for BAGPAK means complete production control in bag manufacture, from the planting of seedlings which eventually produce pulp, to the delivery of the finished sack to your plant —in fact, even to the furnishing of special filling and closing machines to insure the best protection for your product.

Multwall Paper Shipping Bags are described in the above brochure. For your copy, write to Bagpack Division, International Paper Company, 220 East 42nd St., New York 17, Dept. D-9.



**International Paper** COMPANY  
BAGPAK DIVISION

BRANCH OFFICES: Atlanta, Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Newark, Philadelphia, Pittsburgh, St. Louis, Seattle, St. Paul, Tampa, Washington, D.C.  
CANADA: The Continecor Paper Products Ltd., Montreal, Ontario, Toronto.

**One-Stop  
Nitrogen  
Service...  
for fertilizer  
manufacturers**



# **LION Nitrogen** **FERTILIZER MATERIALS**

**LION ANHYDROUS AMMONIA**—For formulation. A uniformly high-quality basic product. Nitrogen content, 82.25%.

**LION AQUA AMMONIA**—For formulation or acid oxidation. Ammonia content about 30%. Other grades to suit you.

**LION AMMONIUM NITRATE FERTILIZER**—For direct application or formulation. Improved spherical pellets. Guaranteed 33.5% nitrogen.

**LION NITROGEN FERTILIZER SOLUTIONS**—For formulation. Three types to suit varying weather and manufacturing conditions.

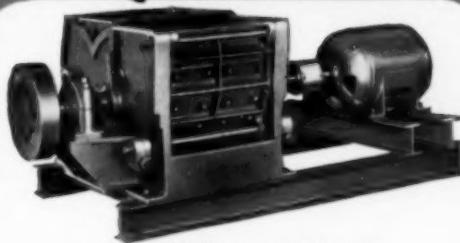
**LION SULPHATE OF AMMONIA**—For direct application or formulation. Large free-flowing crystals. Guaranteed nitrogen content, 21%.

**TECHNICAL SERVICE**—Lion provides special technical assistance for fertilizer manufacturers. Write to CHEMICAL SALES DIVISION for quick service.

**LION OIL COMPANY**  
EL DORADO, ARKANSAS

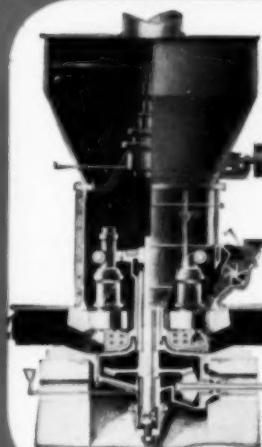


**★ Crush It!  
★ Grind It  
★ Separate It**



#### HAMMER MILLS

For heavy duty crushing or grinding of virtually any mineral or chemical—Williams builds them to do a complete job in one operation! Primary and secondary crushers are unnecessary—extra foundations, conveyors, other equipment are eliminated! You can save up to 75% on initial investment—up to 50% on grinding costs with the right Williams Hammer Mill!!



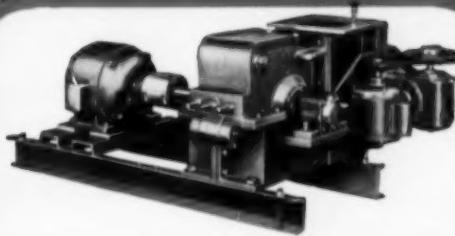
#### ROLLER MILLS

##### WITH AIR SEPARATION

For accurate, uniform pulverizing or blending. Instantly adjustable to finenesses down to 400 mesh, even micron sizes. Dries and grinds simultaneously. Automatic, self-adjusting feed. Many other exclusive engineering and construction features. Williams Roller Mills have set new standards for product quality, output and economy.

**Do It Better,  
Faster And At  
Less Cost With...**

## WILLIAMS



#### HELIX-SEAL HAMMER MILLS

For cleaner, safer dustless grinding of dry materials—or non-clogging, accurate grinding of wet, sticky or greasy materials—to finenesses of 100 to 325 mesh. Combines the advantages of a hammer mill with closed-circuit screw-type feed. No separators, fans or cyclones required. Available with steam or water jackets. Low investment—inexpensive to install and operate.

#### OTHER WILLIAMS EQUIPMENT

- ★ IMPACT and DRIER MILLS
- ★ AIR SEPARATORS
- ★ VIBRATING SCREENS
- ★ COMPLETE "Packaged" PLANTS For Installation In Existing Buildings

#### *At Your Service*

##### WILLIAMS TESTING LABORATORY

Consult Williams on any grinding, crushing, shredding or separation problem, no matter what the material. The most complete testing and research facilities are available without cost or obligation. Simply furnish enough raw material for a test run, and a sample or description of the finished product desired.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.  
3702 N. BROADWAY ST. LOUIS 6, MO.



# WILLIAMS

CRUSHERS                    GRINDERS                    SHREDDERS

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD



**... A RICH HARVEST FOR AMERICA**



This young plant is growing fast. It will begin to bear fruit this fall. And the nation's industry and agriculture will reap the harvest — a harvest of high quality nitrogen products that will contribute to increased comfort and convenience for us all.

This new plant, located in Memphis, Tennessee, is designed to produce 72,000 tons of nitrogen annually, in the form of urea and anhydrous ammonia. It represents a reliable new source for these important chemicals.

Already, urea and ammonia occupy strategic positions in American industrial production — for both civilian consumption and defense. Advancing technology will increase the demands upon the nation's supplies as new fibers, resins, petroleum derivatives, propellants and pharmaceuticals are created. In agriculture, too, more and more urea and ammonia will be needed each year to raise the capacity of our soils for sustained high-level crop production.

Watch this plant grow — and be ready to reap *your* share of the harvest. A free 20-page booklet "Introducing Grace Chemical Company" tells the story in detail. Write for your copy.



**GRACE CHEMICAL COMPANY**  
HANOVER SQUARE • NEW YORK 5, NEW YORK

# PENICK MALATHION

a new insecticide of dramatic  
promise available now... in all-purpose  
**PENICK formulations**

**PENICK MALATHION for outstanding advantages:**

- ➡ LOW MAMMALIAN TOXICITY
- ➡ HIGH INSECT TOXICITY
- ➡ FAST DISAPPEARING RESIDUES

- ➡ COMPATIBILITY
- ➡ ONE OF THE SAFEST  
INSECTICIDES TO HANDLE

Other reliable and effective  
Penick basic insecticides such as

ALLETHRIN — Technical; Solutions  
LINDANE — Technical; Formulations  
PYRETHRUM — Extracts; Synergized Extracts  
ROTIENONE — Extracts; Powders  
RYANIA — Powders; Synergized Concentrates

An Outstanding Penick Rodenticide:

## Dethmor Warfarin

Samples and literature on request!

Use this coupon:



**S. B. PENICK & COMPANY**

50 Church Street, New York 8, N.Y. 735 West Division Street, Chicago 10, Ill.  
Telephone COrtlandt 7-1970 Telephone MOhawk 4-5651

S. B. PENICK & COMPANY Insecticide Div., Dept. AC  
50 Church Street, New York 8, N.Y.

Gentlemen:

Please send samples and literature covering the following items:  PENICK MALATHION  DETHMOR WARFARIN  
 ALLETHRIN  LINDANE  PYRETHRUM  ROTENONE  RYANIA

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



## Phillips supplies NITROGEN in 4 forms

### 1 AMMONIUM SULFATE

New Premium Quality Phillips 66 Ammonium Sulfate is available now! It's dry-cured to remove excess moisture—prevent caking. Uniform, dust-free crystals flow freely—mix easily. Contains 21% nitrogen, ideal for all analyses of mixed goods and for direct application to all farm crops. Contact us now for your requirements.

### 2 ANHYDROUS AMMONIA

Tank car shipments of Anhydrous Ammonia (82% nitrogen) are assured to Phillips contract customers by Phillips huge production facilities in the Texas Panhandle and at Adams Terminal near Houston. Write our nearest Division Office for full information.

### 3 NITROGEN SOLUTIONS

Get more N per dollar! Phillips 66 Nitrogen Solutions are well suited to the preparation of high-analysis fertilizers and the ammoniation of superphosphate. These three nitrogen solutions keep handling costs low! Promote rapid, thorough curing!

### 4 AMMONIUM NITRATE

Phillips 66 Prilled Ammonium Nitrate contains 33% nitrogen. The small, coated prills or pellets resist caking . . . handle easily. Depend on Phillips 66 Prilled Ammonium Nitrate for uniform, free-flowing properties and top-notch crop response.



## PHILLIPS CHEMICAL COMPANY

A Subsidiary of Phillips Petroleum Company, Bartlesville, Oklahoma.

#### Offices in:

AMARILLO, TEX.—First Nat'l Bank Bldg.  
BARTLESVILLE, OKLA.—Adams Bldg.  
CHICAGO, ILL.—7 South Dearborn St.  
DENVER, COLO.—1375 Kearney Ave.  
DES MOINES, IOWA—606 Hubbell Bldg.  
HOUSTON, TEX.—1020 E. Holcombe Blvd.

INDIANAPOLIS, IND.—1112 N. Pennsylvania St.  
KANSAS CITY, MO.—500 West 39th St.  
MINNEAPOLIS, MINN.—212 Sixth St. South  
NEW YORK, N. Y.—80 Broadway  
OMAHA, NEB.—WOW Building  
PASADENA, CALIF.—604 Citizens Bank Bldg.

SALT LAKE CITY, UTAH—68 South Main  
SPOKANE, WASH.—E. 521 Sprague Ave.  
ST. LOUIS, MO.—4251 Lindell Blvd.  
TAMPA, FLA.—1506 South Dale Mabry  
TULSA, OKLA.—1708 Utica Square  
WICHITA, KAN.—501 KFH Building



# MALATHION\*

Cyanamid's new phosphate insecticide

## KILLS FLIES

*... even those resistant to previously effective insecticides*

- Quickly effective, economical fly-killer
- Residual kill lasts up to 21 days
- Easy to handle and apply
- "One of the safest insecticides to handle," says USDA
- Kills flies in larva (maggot) form, too

Malathion has been used with outstanding success throughout the country to control flies. Even flies which have become resistant to DDT and other chlorinated hydrocarbons are controlled easily and economically by malathion . . . a development of American Cyanamid research. What's more, scientific experiments now in progress indicate that flies probably will *not* become resistant to malathion.



A BETTER AMERICA  
THROUGH CHEMICAL PROGRESS



**Distributors and Dealers**—Take advantage of the new profit opportunities created by malathion insecticides. Available from national manufacturers, packaged under their own brand names. Consult your regular sources of supply, or write us for further information.

*AMERICAN Cyanamid COMPANY*

Manufacturer of MALATHION Technical  
AGRICULTURAL CHEMICALS DIVISION  
30 Rockefeller Plaza, New York 20, N. Y.

*Producers of:*

**AERO® Cyanamid:** Fertilizers—Defoliants—Herbicides  
**AEROPRILLS®** Fertilizer Grade Ammonium Nitrate  
**AERO® Ammonium Sulphate**  
**PHOSPHATES** for Acidulation and Direct Applications  
**THIOPHOS® Parathion Technical**  
**CYANO GAS® Calcium Cyanide Fumigants**  
**HCN Fumigants**  
**ACRYLON® Spot Fumigants**  
**POTASSIUM CYANATE** Weedkiller for Agriculture and Turf  
**AEROTILT® Soil Conditioners**  
\*Also known as MALATHION      †Trade-mark

# TOXAPHENE PROTECTS

## FOOD, FEED, AND FIBER CROPS



Wherever you live, it's probable that the crops grown there can benefit from insecticides based on toxaphene (chlorinated camphene 67-69% Cl). Recommended for effective control of more than 150 different species of insect pests, toxaphene dusts and sprays are helping to protect food, feed and fiber crops —to increase yields throughout the world.



## *Editorial* COMMENTS

**R**ECOMMENDED for early Congressional consideration is the snafu which has American fertilizer producers practically disqualified from bidding on supplies of fertilizer which the United States is supplying for Korean and other foreign relief programs. The situation would have hilarious overtones as a prime example of governmental bungling if it weren't so serious.

We are giving fertilizer to various needy foreign countries as a relief measure. Common sense would seem to indicate that the fertilizer to be so given should at least come exclusively from American sources. But because of Congressional insistence that this gift fertilizer be bought from the lowest bidder, many of the contracts are reported going to foreign bidders. Even where American suppliers have an occasional opportunity to compete on a favorable basis, another legal hurdle is interposed. They must ship in American vessels, placing them automatically at a disadvantage, since rates in American vessels are substantially higher than foreign rates.

The charge was made at a recent conference called to consider various complaints connected with this subject that some contracts awarded to west German bidders involved shipment of goods made in Soviet controlled countries. This would be a real travesty,—our generous program of relief serving to help finance our enemies.

Speedy action is called for on the part of Congress to remedy the situation, for apparently the agency in charge of the program,

the Foreign Operations Administration, feels that its hands are tied in the usual governmental red tape, which only Congressional action can slash.

**E**ARLY and favorable action is anticipated in the Senate on the Aiken Bill (S 2860) companion piece to the Miller Bill which was recently acted on favorably by the House of Representatives. With farmers and farm organizations, food packers, legislators and the commercial pesticide industry as well all favoring the measure, there seems to be every reason to anticipate that it will shortly become law.

As we see it, the principal thing the new measure can accomplish is to establish a sensible, efficient, simplified procedure for establishing tolerances, which has long been needed.

But for adequate protection of the public, for adequate protection of the farmer and the food handler, and for the protection of the insecticide industry against the unfavorable reaction which can result from carelessness and misuse of the essential products which it supplies, we don't have and never have had any feeling that a law can in itself be the entire answer. It will still be necessary to keep hammering away day after day—and year after year—warning users to read labels, and to follow instructions—warning users that all pesticides are inherently toxic in nature—warning them to keep supplies of the more dangerous toxicants under lock and key up to the moment

(Continued on Page 110)



## A VISIT TO

# Boyce Thompson

George McNew  
Director

**B**OYCE Thompson Institute for Plant Research, founded at Yonkers, N. Y., in 1924 by William Boyce Thompson, has been an important factor in the agricultural chemical field since that time, and over this thirty year period has made many contributions toward solution of some of the trying problems facing those concerned with maintaining and increasing our agricultural production,—in particular the development of new chemical products for agriculture,—and new methods for their application to crops to control pests and diseases.

In the words of the founder, the Institute was established to "study why and how plants grow, why they languish or thrive, how their diseases may be conquered, how their development may be stimulated by the regulation of the elements which contribute to their life." This broad basic concept of research has led to many practical discoveries.

The basic discoveries on plant growth and the pests afflicting plants have opened entirely new fields for industrial development. Conspicuous among these are the discovery of chemicals that regulate plant growth, extend or synergize insecticides and serve as new types of selective herbicides. The techniques developed by the Institute scientists in assaying the response of fungi and plants to chemical stimuli have come to be accepted as standard in many industrial labora-

tories interested in developing agricultural chemicals.

In addition to the influence of its basic program, the Institute has directly or through cooperation with industry been instrumental in creating new products. Some fifteen of the new organic chemicals that have spearheaded the current revolution in pest control either have originated, have been developed, or have undergone some phase of original study by the scientists at the Institute.

The staff responsible for these basic and applied research programs are plant physiologists, plant pathologists, entomologists, biochemists, organic chemists, physical chemists, microbiologists, etc. The 55 members operate as closely integrated research teams rather than as professional departments. The scientists are provided with services of laboratory assistants, engineers, gardeners, librarians, and photographers to relieve them of routine insofar as possible.

In addition to standard, modernly-equipped laboratories and greenhouses, special facilities have been provided for common use. These include various refrigerated and incubator rooms, a suite of new light-temperature chambers for studies on photo-periodicity, a large recently remodeled fly laboratory and Peet Grady room for evaluating household insecticides, special facilities for mosquito culture, extensive facilities for applying fungicides, insecticides, and herbicides as sprays, dusts and fumigants, a series of temperature-

humidity chambers for infecting plants and studying deterioration of material, special greenhouses for aerial and soil fumigation and light control, a series of six portable houses for study of air pollution, etc. Special equipment, such as spectrophotometers, ultracentrifuge, microrespirometers, scaling apparatus and automatic sample changers, and counting devices for radioactive tracer work and chromatography cabinets, is installed wherever needed. These facilities occupy a laboratory building with almost 100,000 sq. ft. of floor space and 18,000 sq. ft. of greenhouses.

Besides six acres of ornamental plantings around the Institute laboratories, two other areas are maintained as sources of experimental plant materials: field and orchard plots in Nepera Park in Yonkers, and an area of almost 300 acres of wooded arboretum containing about 3000 species of native and introduced plants.

Investigations currently underway on chemicals deal with (1) the effects of air pollution on plant growth; (2) the development of new insecticides, fungicides, herbicides, growth regulants, and the improvement of compounds already available; (3) physiological effects of insecticides; (4) physiology of seeds, . . . use of chemicals to break dormancy and bud sprouting; (5) regulation of plant growth by chemicals; (6) nature of the mechanism of fungicidal action; (7) development of synergistic compounds to accelerate the activity of insecticides; etc.

# Institute



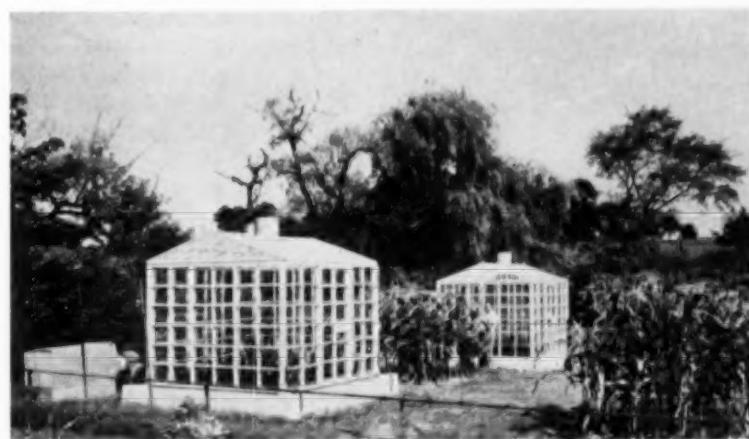
**Principal research** laboratories contain over 99,000 square feet on two floors. Service facilities and greenhouse preparation rooms are in the basement.

The Institute is engaged also in projects dealing with the safety of residues of agricultural chemicals. Its staff has worked in cooperation with the American Medical Association, the National Canners Association and pesticide manufacturers in the development of standards of safety, and improving methods of detecting potentially harmful chemicals.

Studies of the physiological effects of insecticides led to the discovery of the synergistic properties of piperine and the development of related synthetic insecticides. Mosquito larvae are used in these studies, since they are particularly sensitive to many of the compounds which also affect warm-blooded animals adversely.

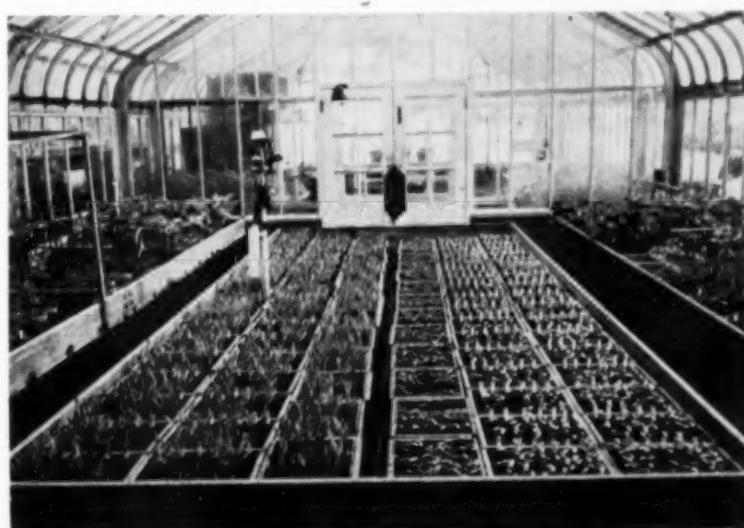
The nature of fungicidal action, uptake of fungicides by spores, and the effect of fungicides on respiration of spores and consequent effect on germination are specific lines of investigation at present by Dr. S. E. A. McCallan, Dr. L. P. Miller, and Mr. R. M. Weed. The mechanism of action of sulfur is under restudy, using radioactive tracers. A report on the use of radioactive isotopes in fungicide research by Drs. McCallan and Miller appeared in the February issue of *Agricultural Chemicals*.

Discussing the amount of toxicant necessary to inhibit germination of fungus spores, Drs. McCallan and Miller report that high doses of imidazoline, cerium and silver are required. ED<sub>50</sub> values are in the range of 5,000 to 10,000 ppm, depending



**Above:** A field trial on the effect of hydrofluoric acid on crops uses portable house, which can be moved from plot to plot after different periods of exposure.

**Below:** Tests on the evaluation of seed protectants on corn and cucumber are started in climate control chambers, where conditions are favorable to the development of soil microorganisms.



on the toxicant and spore involved. Even silver, recognized as a very effective fungicide, has ED<sub>50</sub> values in the range of 100 to 500 ppm. It is interesting to note that insecticides are effective toxicants used in the neighborhood of a few ppm or less, as compared with the high rates required of even the most efficient fungicides. Still another observation is that unrelated fungicides act independently of each other. Drs. McCallan and Miller point out that it is probably because the sites of reaction in the spores are different for unrelated chemicals.

#### Plant Growth Research

**S**TUDIES of the biological activity of hormone-like compounds such as indolebutyric acid, substituted benzoic acids, naphthaleneacetic acid, and the substituted aryloxy acid (2, 4-D) series, led to some of the outstanding changes in agriculture during the past 20 years. Dr. P. W. Zimmerman and Dr. A. E. Hitchcock, in their studies on regulation of plant growth, point out that maturing of fruit buds can be delayed through treatment with growth substances, which leads to the assumption that fruiting of tropical species and flowering of plants, in general, may be staggered to extend throughout the entire year. Current studies are being made to determine how plants respond to growth regulators, the reasons for difference in susceptibility of species, and what determines the activity of the molecule. Eventually there will be special regulators for every type of response and formation of organs.

Studies of injury to plants by air contaminants such as sulfur dioxide, hydrogen fluoride, chlorine, hydrogen sulfide and ammonia, are underway with renewed interest, in view of the resulting air pollution through increased industrial activities. A cooperative project designed to investigate all aspects of this problem has recently been established with industrial sponsors, and a department of the federal government.

In view of the many practical aspects of research findings, and commercial value resulting from investi-

gations, the Institute cooperates with industry in applied research programs. Dr. McNew points out that many sponsors come to the Institute to obtain basic information and guidance in perfecting techniques. Some of the sponsored projects are primarily in fundamental research while others have practical objectives.

Research at Boyce Thompson Institute has been sponsored by such concerns as the Aluminum Company of America; Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corporation; E. I. du Pont de Nemours & Co.; Ethyl Corporation; B. F. Goodrich Chem. Co.; John Powell Laboratories; Mathieson Chemical Corp.; National Canners Association; Niagara Chemical Division of Food Machinery and Chemical Corp.; Stauffer Chemical Co.; Texas Gulf Sulphur Co.; Westvaco Division of Food Machinery Corp.; U. S. Atomic Energy Commission; and many others.

Dr. R. H. Wellman, who heads the research projects sponsored by the Union Carbide and Carbon Corp., indicates that investigations are underway to find an adequate fungicide for control of wheat rust. They are always interested, he adds, in discovering effective products which may be used with greater safety. Development of herbicides, and insecticides having greater selectivity, is another line in which research is currently underway at Boyce Thompson Institute.

Dr. Wellman also outlined the interest in studies dealing with what can be done to the plants constructively . . . i.e., in connection with flowering, producing high protein fruits, and regulation of plant size by chemicals. As a result of the Carbide research projects, the complete line of "Crag" products were developed at the Institute. A recently developed herbicide, "Natrin", is currently in the field testing stage. Last year's field work shows this material to have real promise for use in controlling weeds in tomato fields. No satisfactory chemical currently exists for this market. Encouraging results have also been obtained in cotton.

Dr. P. H. Schuldert, heading the Ethyl Corporation research studies, reports similar lines of relatively recent investigation. A development of his particular studies is experimental Fungicide B-622 (2,4-dichloro-6-(o-chloroanilino)-s-triazine), which appears to be effective for control of apple scab, celery early blight, muskmelon leaf spot, potato late blight, and other diseases.

Every research laboratory in industry must decide sooner or later how much effort to apply toward basic research and to applied development programs. These two aspects of research are often considered as conflicting interests. The Institute's record refutes this viewpoint.

"Good, sound basic information has a unique habit of being useful. Effective applied research, on the other hand, calls upon the fundamental resources of science and often points the way to need for more basic information," Managing Director McNew points out. "Applied projects are not undertaken at the Institute unless the basic skills necessary for their solution are available and the sponsors are amenable to seeking additional basic information whenever necessary. Only by ignoring immediate utility until the tools of research are fashioned can science perform the greater, more efficient service expected from it on behalf of mankind."

These fundamental concepts have operated something as follows in practice. Following the broad mandate of the founder, Dr. Zimmerman and Dr. Hitchcock set out to study growth and differentiation in plants. From such basic studies came the indole compounds to regulate rooting of cuttings and the aryloxy acids (of which 2,4-D is an example) to control differentiation of broad-leaved plants. A new industry in selective herbicides was created. The project sponsored by Carbide and Carbon Chemicals Co. at the Institute then set out to explore the field more thoroughly. In the course of it, sodium 2,4-dichlorophenoxyethyl sulfate proved to be inactive as a herbicide spray but

(Continued on Page 123)

# *Changing Technology of the* **FERTILIZER INDUSTRY**

**T**HE value of certain natural products, principally animal manures, as nutrients for crop plants was known to ancient civilizations. Not till the middle of the 19th century were the principal plant foods identified chemically. This discovery was followed shortly by the commercial production of "manures" which later developed into the commercial fertilizer industry as we know it now.

About 100 years ago, 20,000 tons of mixed fertilizer were manufactured annually in the southeastern United States. Today, some 23 million tons are being produced annually by plants scattered all over the country. It is estimated that there are over 1,000 fertilizer plants producing mixed-fertilizer in the United States today, owned by some 700 companies.

A large portion of the industry owns little, if any, raw material sources. Until recently, none of the manufacturers had access to captive nitrogen in the form of ammonia, and only a few have now. Only one manufacturer controls his own potash supply. This manufacturer is also among the small group of phosphate rock deposit owners.

Most of the manufacturing plants are in essence dry-blending units. About ten per cent of the manufacturers are among the group that produces at least its own normal superphosphate. Table 1 shows some data about this group. In 1951 there were 85 such manufacturers, in control of 202 plants. Six manufacturers produced over 44 per cent of all normal superphosphate and owned two-thirds of the captive sulfuric acid plants in the hands of fertilizer manufacturers. It is interesting to note that the average plant size for these six large companies differs little from

the average size of plants owned by small companies. This seems to hold true for the entire mixed-fertilizer industry, with very few plants exceeding capacities in the neighborhood of 50,000 tons per year.

At the same time, eight manufacturers produced all the triple superphosphate made in nine plants. Five of these producers, owning six plants, were among the six large companies mentioned above, while one was government operated, and the remaining two belonged to corporations that did not sell mixed fertilizer at

#### **The Industry's Market**

MOST commercial chemicals are sold in a variety of markets for a variety of uses. This makes for a complex consumption and demand picture, difficult to forecast at times. On the other hand, slumps in certain markets may be compensated for by greater demands in others. The picture is entirely different for commercial fertilizers. These materials are sold to a single industry whose primary product is food. As Table 2 shows, food production utilizes at least 75 per cent of all fertilizer sold. The remaining 25 per cent goes into crops such as cotton and tobacco.

Figure 1 shows that the consumption of fertilizers has tripled in the last 15 years. Farmers are actually spending a larger fraction of their

gross income on fertilizers, and the money spent today is a larger portion of production expenses than it was a few years ago, as Table 3 shows.

#### **The Changing Technology**

WHILE the fertilizer industry as a whole is being modernized slowly, some of its members are getting ready for great technological changes as table 4 shows. The proposed expenditures for concentrated-fertilizer process plants shown in this table represent only those ventures for which partial accelerated tax write-offs are being sought. There are probably a number of other projects under way which were undertaken entirely without government assistance.

It is interesting to analyze the possible implications suggested by Table 4. All the projects listed, whether for production of triple superphosphate, nitraphos, or ammophos, aim at concentrated goods via continuous processes. Some of them will operate without any sulfuric acid whatever. Nitraphos and ammophos processes are generally designed to produce granulated products. The average plant investment will be about five or six times that required for a conventional mixed-fertilizer plant. Furthermore, there are indications that the average plant using these processes may have a

\*Paper presented at the American Inst. of Chemical Engineers, March 10, Wash. D. C.

**TABLE 1**  
**Summary of Normal Superphosphate Producer Statistics as of September 1, 1951.**

	Producers 5 Plants or Less	Owning More Than 5 Plants
Number of producers	79	6
Total number of plants	106	96
Average number of plants	1.34	14.0
Total number of $H_2SO_4$ plants	31	60
Average number of $H_2SO_4$ plants	0.39	1.0
Percentage of integrated superphosphate plants	29.0	62.5
Total output, $10^6$ tons	9.18	7.36
Average plant output, $10^6$ tons	79	77

SOURCE: USDA (1)

capacity considerably greater than the 50 to 60,000 tons per year of the present conventional plant.

#### The Factors Behind The Changes

TO understand the motivating forces behind the technological changes in the fertilizer industry, it is necessary to take a second, closer look at the fertilizer market. Food is consumed by people, and people multiply. Figure 2 shows that the population of the United States has approximately doubled in the last 50 years. Yet we eat more and better foods today than most people did fifty years ago, as shown by the data of Figure 3. The most remarkable fact in this picture is the almost constant acreage that has yielded all this food. Figure 4 shows that this has been accomplished by a startling increase in farm productivity.

Farm productivity has, of course, been increased by many means. Among the most spectacular has been the almost complete mechanization which has taken place in the last few decades. More productive plant varieties, such as hybrid corn, have contributed noticeably. It is believed that most of the benefit has been reaped from these two factors. Other factors that may be expected to show continued contributions are pest, disease, and weed control, and fertilizers.

Actually, our farm productivity is so high at this moment that we have surpluses in some products which, because of our high farm-price levels, cannot be sold anywhere except at taxpayers' expense. Looking again at the population curve of Figure 2, we might expect a population increase

of about 40 million, or about 25 per cent, in the next twenty years. Food production, as a whole, will have to increase to feed the extra mouths. Estimates of this increase range as high as 50 per cent. Lower population increases and constant per capita food consumption might drop this figure to about 20 per cent. Too little is known about the quantitative relationship of the many factors that affect food consumption to determine the accuracy of such estimates.

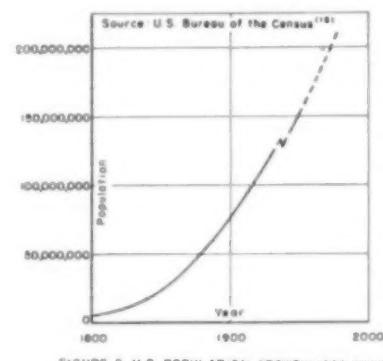


FIGURE 2. U.S. POPULATION GROWTH, 1800-2000

— 1950

A realistic appraisal of the fertilizer market should therefore consider these two possibilities: (1) food consumption over the next twenty years may increase no more than 20 per cent, and (2) fertilizer may have to compete with insecticides, weed killers, and disease-resistant plants in furnishing this increase in

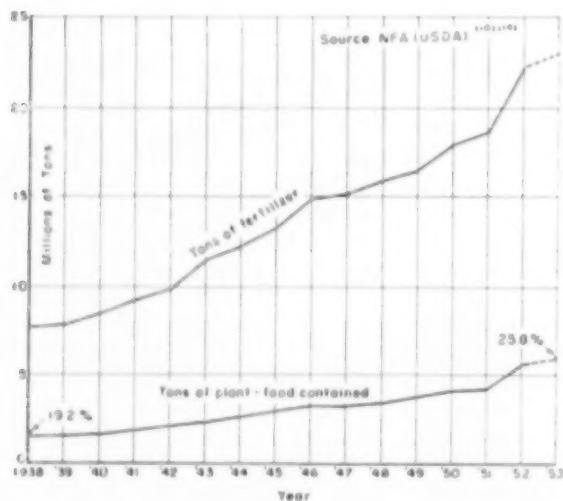


FIGURE 1. FERTILIZER CONSUMPTION AND PLANT-FOOD CONTENT

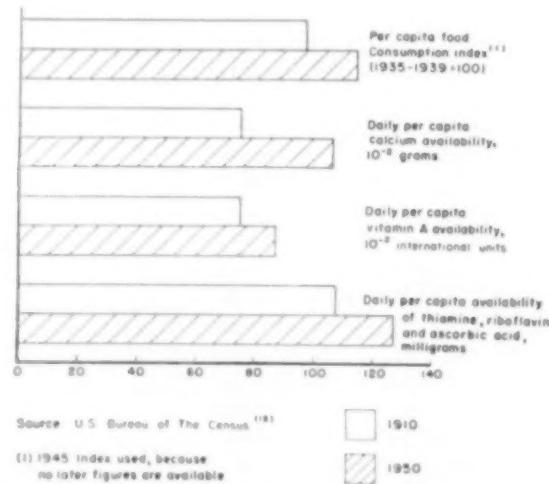


FIGURE 3. CONSUMPTION AND QUALITY OF FOOD IN THE UNITED STATES

**TABLE 2**  
**Fertilizer Consumption by Major Crops**

Crops	Per Cent of Total Consumption
Corn and wheat	34.5
Hay, oats, barley, and pasture	18.7
Vegetables, potatoes and sweet potatoes	17.0
Fruits and nuts	4.4
Cotton and tobacco	17.2
Other	8.2

Source: NFA(11)

food production. Any fertilizer manufacturer who is prepared to meet such a situation need not worry about increasing or retaining his portion of the gross farm income.

#### Cost Reduction

THE answer to the problem of keeping and expanding existing markets has been furnished by other industries in the past; it is to produce better products at lower cost. To put it another way, the manufacturer must increase the value, tangible or intangible, of his merchandise while reducing his cost of providing it. For purposes of discussion, fertilizer production costs have been classified under the following headings:

- Raw Materials
- Processing
- Administration
- Distribution.

Figure 5 shows what is believed to be a representative distribution of these costs for a fertilizer manufacturer engaged in both superphosphate production and blending operations, using captive sulfuric acid, and purchasing all other raw ma-

**TABLE 3**  
**How Much Do Farmers Spend For Fertilizer?**

Year	Fertilizer and Lime Purchases		
	Billions of Dollars	Per Cent of Gross Income	Per Cent of Production Expenses
1948	0.811	2.35	4.28
1949	0.882	2.78	4.86
1950	0.938	2.92	4.76
1951	1.061	2.88	4.75
1952	1.165	3.19	5.06

Source: Fertilizer News(9)

terials. The materials-handling methods reflected in the processing and distribution costs are believed to be equal or slightly superior to the average in the industry. The raw material cost is based on what are believed to be the cheapest raw materials that can be used in a conventional mixed-fertilizer plant. Nevertheless, the cost of raw materials and distribution make up almost 90 per cent of the cost of the fertilizer. This suggests rather strongly that any changes in technology should aim at reductions in these two areas.

#### Raw Material Cost

One change in raw material cost has already taken place to a considerable extent, as shown in Figures 6 and 7. The synthetic ammonia industry has, in the course of about three decades, captured the bulk of the fertilizer trade, by being able to supply concentrated nitrogen materials at unit costs considerably below those of the supplanted materials.

**TABLE 4**  
**Concentrated Phosphatic Fertilizer Plants Certified by DPA in 1953.**

Process	Number of Plants	Estimated Cost Millions of Dollars
Triple superphosphate	12	69.9
Ammophos	6	40.7
Nitraphos	6	26.2
	24	136.8
Average plant investment =		5.7 million dollars

Source: Fertilizer News(7)

Quite fortuitously, this change did not require any significant modifications of equipment or operating procedure on the part of the fertilizer manufacturer.

Figure 7 further suggests that direct application of anhydrous ammonia to the soil may become the preferred method of supplying nitrogen, where it is the only nutrient required at the time of application, and where it can be applied without damage to the plants.

No drastic reduction in the cost of potash seems to be in sight. On the contrary, the present raw material, potassium chloride, is the most concentrated source of potassium practically usable, and its cost is likely to increase once the more accessible deposits are exhausted.

It is on phosphatic materials that attention has been focused, because the greatest room for improvement lies here. Our resources of fluoroapatite are ample, but present methods

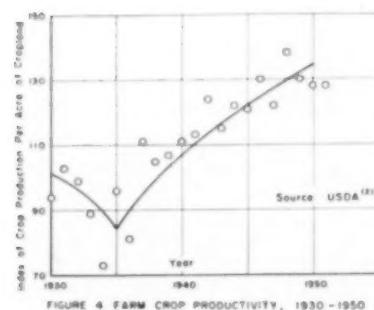
**TABLE 5**  
**Comparison of Operating Indices for Batch and Continuous Triple Superphosphate Acidulation Units**

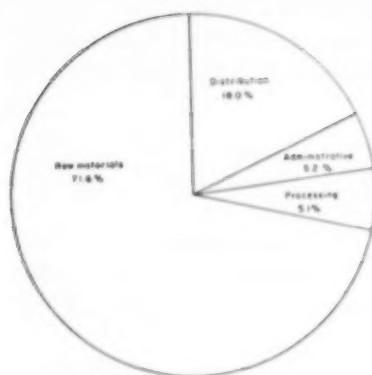
	Batch Process	Continuous Process
Number of mixer units	2	1
Production rate, tons of superphosphate/operating hour <sup>(1)</sup>	30	40
Power required, kw-hr/ton of superphosphate	1.0	0.1
Operating labor <sup>(2)</sup> , man-hr/ton of superphosphate	.16	0.04
Maintenance labor, man-hr/ton of superphosphate	.17	0.02
Maintenance materials, cents/ton of superphosphate	9.7	0.9

(1) In addition, the percentage of scheduled time operated is much greater for the continuous process than for the batch process because less maintenance and cleanup are required.

(2) Includes foreman.

Source: TVA(5)





**FIGURE 5. Distribution of overall costs for one conventional mixed fertilizer plant.**  
Source: Battelle Memorial Institute [1]

of processing it leave much to be desired. The conventional treatment with sulfuric acid, whether to make normal or triple superphosphate, produces also an equivalent amount of calcium sulfate, which in normal super is undesirable, and as a by-product from triple super, is worthless.

Besides the major nutrients, the fillers, generally called "conditioners" in the trade, have to be considered seriously, because they do fulfill the function of reducing caking in conventional goods. Certain processes, such as granulation, by eliminating these materials, can reduce considerably the raw material cost per unit of plant nutrient.

Figure 8 shows examples of raw materials cost variation when a given formula is produced, (1) by the conventional process, using conditioners; (2) by a granulation process, eliminating conditioners; and (3) by a nitraphos process. It shows that granulation may reduce raw materials cost by as much as four dollars per ton, and that a nitraphos process,

for a 10-10-10 formula, may save an additional four dollars per ton. No details of nitraphos raw materials cost were found for formulas containing less than seven units of nitrogen. Some cursory estimates indicate, however, that the nitraphos process may not permit any savings at lower nitrogen contents.

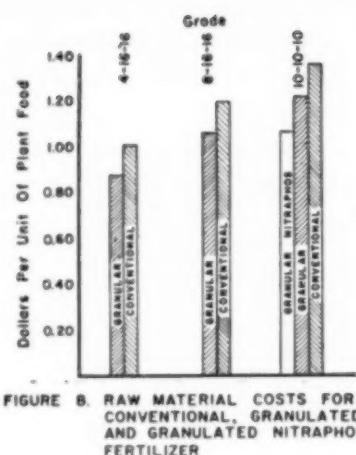
#### Processing Cost

The data available on the various new processes cannot be directly compared with the data of Figure 5, because this figure was prepared for a plant producing a variety of grades with an average nutrient content of about 25 units, whereas the published data for new processes cover generally only one formula, usually of quite different analysis.

Table 5 suggests that processing costs may be reduced without changing the composition of the product, merely by converting from a batch process to a continuous process. It compares certain operating indices for triple superphosphate production by a batch method and by a continuous method. The factors covered by the indices in Table 5 showed an estimated saving of about 78 cents per ton for the continuous process.<sup>8</sup> Allowing for estimating errors by reducing the likely savings to about 40 cents per ton, an annual production of 50,000 tons might save 20,000 dollars per year. This in turn would warrant consideration of an investment of up to \$100,000 dollars for process equipment. It is believed that the TVA cone-mixer and auxiliaries, to which these figures apply, would cost less than \$100,000.

Little information is available on the use of the TVA cone-mixer for the manufacture of normal or enriched superphosphate. It is likely that many of the advantages demonstrated in the manufacture of triple superphosphate would apply in this case too.

Another example of simple conversion from a batch unit to a con-



**FIGURE 8. RAW MATERIAL COSTS FOR CONVENTIONAL, GRANULATED, AND GRANULATED NITRAPHOS FERTILIZER**

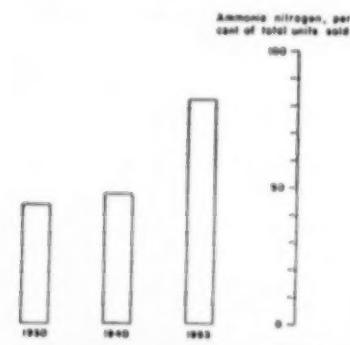
Midwestern Location; Prices as of Feb. 4, 1954.

tinuous one deserves mention here. The continuous ammoniator demonstrated last year by TVA shows promise of becoming the successor to the traditional one- or two-ton dry-blender which has dominated the manufacture of mixed fertilizers for such a long time. Although no operating cost data are available at this time, it is believed that it will permit savings in labor and materials handling costs.

Returning now to the two processes that promised substantial reductions in raw material cost, we find that other costs increase, but not enough to offset the large savings in raw material cost.

Detailed estimates were made for a granulation process in conjunction with conventional batch-mixing facilities. Figure 9 shows that processing cost is the one item in the comparison with the conventional process which shows a significant in-

(Turn to Page 115)



**FIGURE 6. AMMONIA'S SHARE OF THE FERTILIZER NITROGEN MARKET**

<sup>8</sup>In the absence of operating cost data for a triple superphosphate batch process, it was assumed that the costs incurred in the batch production of normal superphosphate in a conventional den, such as the Weaver or Sturtevant unit, would be sufficiently similar to allow substitution.



**FIGURE 7. UNIT COST AND CONCENTRATION OF SOURCES FOR FERTILIZER NITROGEN**

# LEGAL ASPECTS

in marketing

**AGRICULTURAL CHEMICALS**

**By John D. Conner\***

NAC Legal Counsel

**I**T is a sound principle of military tactics that in planning a campaign one must anticipate the poorest possible position which he may be called upon to defend. He must then prepare to defend that position. This principle of military preparedness is equally applicable to those operating in the agricultural chemical or, as a matter of fact, any other field.

For the purpose of our discussion we may assume that the "poorest possible position" for the manufacturer, dealer in or applicator of a pesticidal product would arise when the sheriff appears with a summons advising that some plaintiff has brought suit in which he alleges that he has been damaged because of some shortcoming in the product. It is from the perspective of this "poorest possible position" that we turn to a consideration of research and production controls.

We cannot be certain in advance of the exact nature of the damages which the product will be alleged to have caused. The action may be for damages arising from the failure of the pesticide to give adequate control. It may be for injury to plants to which the pesticide was intentionally applied for control purposes or to plants upon which it drifted unintentionally. The action could be for off-flavor in produce

to which the pesticide was applied directly, or for off-flavor in produce grown in soil contaminated with residues from a pesticide previously applied. It could arise because the use of the pesticide left an excessive residue on the food—resulting in its seizure under the Federal Food, Drug and Cosmetic Act or in its rejection by a food processor. The action may be for injury to cattle resulting either from direct application of the pesticide to the cattle or because the cattle have eaten feed bearing excessive residues of the pesticide. The action may result from personal injury to the applicator or to others in the environment in which the pesticide was used. There may be still other types of damages from which the action arises.

Whatever type of action it might be, it would arise, in all probability, because of one or more of three basic deficiencies:

First, inadequate research to determine the capabilities and limitations of the product, and the manner in which it should properly be used;

Second, the failure to use production controls adequate to assure that the product is so produced and packaged that it meets the standards developed as a result of the research, or

Third, the failure to label, advertise, or otherwise represent the product so that it properly reflects the capabilities, limitations and precautions developed by the research.

My remarks will be directed to the first two of these basic defi-

cies—research and production control.

Of one thing we may be certain. You cannot wait until after your "poorest possible position" materializes to conduct your research and establish your production controls. Your lawyer cannot defend your case on evidence manufactured after the action is brought.

The legal implications of research fall into two categories. First, to what points should research be directed and, second, what mechanics should be used to conduct and record that research?

Legal requirements dictate the scope and direction of your research. Our consideration of this question must be rather summary. The requirements for each product will vary.

Probably the most direct answer to the question of the points to which research should be directed is found in the regulatory provisions of the Federal Insecticide, Fungicide and Rodenticide Act, and the counterpart state acts. Most manufacturers are familiar with those provisions. But do not make the mistake of believing that you have fully met the requirements of those acts just because your product has been accepted for registration.

This is what the Supreme Court of Virginia recently said in the McCannahan case in discussing the obligation imposed by these statutes:

"Back of both the federal and Virginia statutes lies the need to provide the public with a higher and a surer degree of protection."

\*Before spring meeting, National Agricultural Chemicals Assn., Houston, Texas, March 26, 1954.

than is afforded by exclusive recourse to common law remedies. . . . The statute itself creates the standard of conduct required. . . ."

In other words the court said that if any pesticide manufacturer violates any provision of the federal or state law, he is responsible for the damages resulting from that violation—and the question of whether there has been a violation of the statute is to be left to the jury.

Therefore, the extensiveness and scope of the questions to which research should be directed must be measured primarily against the requirements of the pesticides statutes, as supplemented by the regulations and interpretations issued under those statutes. Remember that those statutes are broadly construed to give maximum protection to the public, to useful vegetation and animals. The provisions through which this protection is accomplished are myriad. Your research must be extensive enough to meet those requirements.

There are other legal requirements in addition to these statutory requirements. The common law requires each person to exercise ordinary prudence in designing and marketing his products. However, these somewhat general requirements lose their significance when they are measured against the specific provisions of the pesticide laws.

The second facet of this question relates to the mechanics through which the research should be conducted and recorded to assure that it will serve its purpose most effectively if its use as evidence should be required.

Who is to conduct the research, and where is it to be performed? On these points, the decision of the lawyer and the scientists will be substantially the same. Both will want to assure that in the case of field tests, the geographical areas in which the tests are conducted will be representative of all areas in which the product is to be used. The lawyer may be inclined to stress the desirability of having the research conducted by a public institution. He may believe that research conducted under such circumstances would be

more impressive to a jury. It is essential that the person conducting the research record fully all observations on any factor which could be relevant in any future product liability action, regardless of how obvious these observations may appear at the time. For example, if an insecticide is being field-tested for insecticidal activity, the condition of the foliage should be recorded at the time of each inspection. If it is not, it would be rather unconvincing for the researcher later to tell a jury that the condition of the foliage must have been good or he would have made some notation to the contrary.

The research must be extensive enough to obtain data on all stages of plant growth to reflect practical farm procedures.

Likewise, the researcher should record fully all variables which possibly could affect any performance or safety characteristic of the product. For example, if the amount of rainfall, the temperature or the foliage condition at the time of application could vary the phytotoxicity, these variables should be recorded.

After this basic research is concluded, the appraisal of the data on all relevant factors should be reduced to writing. If the data shows a critical range for any variable which may affect any performance or safety characteristic, this point should be emphasized.

All the basic research data, and the evaluation should then be compiled and prepared as permanent records. Valuable time will be lost at the most critical time of the case, if you must scurry around and complete all this information after the action arises. I suggest that a number of copies of both the basic research data and the evaluation be prepared and retained, so that it will be immediately available in such a form that it tells the entire story of your research.

The question may arise of the extent to which you may rely on research work conducted by others in marketing your product. Remember that when you market a product under your name you assume re-

sponsibility for it. It would be no defense for you to tell the jury that you thought the product was safe because other persons had tested it, or recommended it, even though the others might be a governmental agency or a land grant college. Of course, you may rely on the research of others if the result of that research is available to you for evaluation and use as evidence if it is required. However, I recommend that before you market a product based upon the research of others, you examine the basic data, evaluating it, and make certain that it will be available to you as evidence if you should require it.

WITH the conclusion of research, we reach the point where plant operations begin. We leave the first area of risk and enter a second. Here the problem takes on different characteristics. The first problem was to develop a product which is safe and effective. The second problem is to assure that the fruits of this research are not lost in the process of production—that the items leaving your factory conform to the standard product.

What controls can be adopted which later can be used as evidence that your product was properly produced, and conformed with your standard when it left your plant? This problem is made more acute by the fact that your product will usually be mixed by others in equipment over which you have no control, and frequently with products produced by others.

If the evidence of the plaintiff shows, or raises an inference, that the mixture as applied was contaminated or otherwise adulterated, the court may shift to you the burden of showing that it was not your product which was the offending ingredient. It will be imperative for you to show that your product was not adulterated when it left your plant. What evidence will you have of this?

The first question is one of identification. Can you identify the

(Turn to Page 127)

## Effect of Insecticides on Soil

By H. H. Slawson

A STUDY has been started at the Riverside, Calif., experiment station of the California College of Agriculture to determine what plant damage can result from absorption of pesticides by the soil. Reports have also been released by the Wisconsin Agricultural Experiment Station on other aspects of the same problem.

The California experiments may run five to ten years, a station report says, and will cover the effect of insecticides on flavor, plant health, soil microbiology, water penetration and physical-chemical changes in the soil. Procedures to be followed were outlined in a brief preliminary report, released in March and two early findings related to flavor were announced.

Carrots raised in one test were treated with nine different compounds, then samples of cooked and raw carrots were presented to a taste panel. "No significant off flavors were detected by the panel," says the report. Likewise, in a test involving baby lima beans treated with ten different compounds, the panel delivered an identical verdict, namely: "No significant or consistent off flavors were detected."

In a potato flavor evaluation test, however, results were different. Four chemicals at different rates were applied in six treatments of 28 plots with these results when the potatoes were submitted to a taste panel: "Lindane resulted in an objectionable flavor in all instances. DDT caused a change in flavor but was not significantly objectionable. With aldrin, there was a suspicion of flavor change, and with dieldrin no apparent change."

In another series of tests, the behavior of the chemical under continued cropping is still under study, and the report submits some results obtained with Kanoka oats and stringless Black Valentine bush beans. Relatively high dosages of seven com-

pounds were used in an attempt to produce plant injury. In the first of four plantings, the report continues, DDT at 1,024 pounds per acre, lindane at 16 and dieldrin at \$12, were used, resulting in significant reduction in growth of the oats. This also proved true in the fourth planting, with treatment of lindane at 32 lbs. per acre, aldrin at 2%, dieldrin at \$12, heptachlor at 12% and chlordane at 2%.

DDT had no effect on the fourth planting and toxaphene no effect on plant growth of the oats at dosages tested in either the first or fourth planting. In the fourth planting aldrin, heptachlor and chlordane reduced growth of the oats at a lower dosage per acre than used in the first planting. This, comments the report, "may indicate that when these insecticides have remained in the soil for a period of time, they become more toxic to Kanoka oats, possibly due to decomposition products."

Regarding effects from use of the compounds at various rates on three crops of the Black Valentine bush beans the report says, "Growth was significantly reduced in the first planting, also in the third planting, when pounds per acre were twice that used in the first planting. "In all cases," adds the report, "in the third planting there was a reduction in toxicity of the various insecticides to these beans."

Meanwhile, at the Wisconsin Agricultural Experiment Station, a forest soils specialist, Dr. G. K. Voight, was studying effects of insecticides, fungicides and herbicides on tree seedlings grown in soil treated with the compounds. Radioactive superphosphate and potassium nitrate were added to the treated soils, so that uptake by the plant could be traced. The report details procedures followed, comments on varied results and summarizes these as follows: "This study indicates that

some of the compounds applied for control of fungus diseases, weeds and insects, definitely affect absorption of phosphorus by growing seedlings. Some of these chemicals can stunt nursery stock; others seem to be safe. How much they damage the plant depends on the type and amount of chemical used."

Other Wisconsin researchers report that weed killers used in some forest plantation trials during three years "really paid off." Drs. A. J. Riker and J. E. Kuntz found that transplants were able to survive weed and grass competition, but that unweeded cottonwoods from dormant cuttings often suffered 100 percent mortality the first season. On some plots weeded by chemicals and on some cultivated areas there was 100 per cent survival of cottonwoods and good growth—depending on soil type and available moisture. Terminal growth the first year on sand was 18 inches; on loam 3 feet; and on muck 3 to 4 feet.

In repeated tests, detailed in the report, many varied chemicals controlled weeds—a few with little or no injury to trees. Still another note in the Wisconsin station's latest annual report deals with the effects of aldrin and dieldrin on soil micro-organisms. Recent laboratory tests show that very few organisms are harmed by these new insecticides. One type of bacterium, in fact, is believed able to grow on the surface of aldrin crystals with no other source of energy.

Ten parts per million of aldrin (20 lbs. per acre) slowed the growth of a few kinds of bacteria, it was determined. That was, however, an extra heavy dose, since the usual application is less than 3 lbs. per acre. "Aldrin doses—no matter how large—did not change the number or kinds of bacteria present in soil very much. Organic matter decomposition, nitrate production and carbon dioxide liberation went on unchanged in treated soil. Bacteria that form nodules on clover were not harmed. The insecticide may last in the soil for a few months to a few years but will not damage bacterial activities."

# California's FERTILIZER INDUSTRY

CALIFORNIA consumes more fertilizer than does any other state in the country, with the exception of North Carolina. Latest figures for the crop year ended June 30, 1953, indicate a total fertilizer consumption for California of about 1,800,000 tons.

Not only does California stand second in the list of fertilizer consumers, but except for states like North Carolina, Alabama, Georgia and Florida in the South, which historically have been the most important fertilizer consuming areas . . . and states like Ohio, Indiana and Illinois in the mid-west . . . California is the only other state to use upwards of a million tons of fertilizer annually.

Sidney H. Bierly, executive secretary of the California Fertilizer Association, reports that the total commercial fertilizer sales in California amounted to 802,200 tons in 1953, as compared with 749,068 tons in 1952. It is worth noting that while in some areas fertilizer consumption was dropping off toward the end of 1953, California is one state where the consumption trend

By  
**C. Sidney H. Bierly**  
Secretary  
California Fertilizer Association

is still upward. Farmer acceptance of complete mixed fertilizers is partly responsible for the steady upward curve of the fertilizer sales line.

Some of the fertilizer mixing plants of California and Arizona are reviewed in this report. Other plants will be described in two succeeding issues. The initial report on the California fertilizer industry was presented in the November 1952 edition of *Agricultural Chemicals*. S. H. Bierly, points out that since that time, fifteen new members have been admitted to the CFA, and the application of another prospective member is currently awaiting approval.

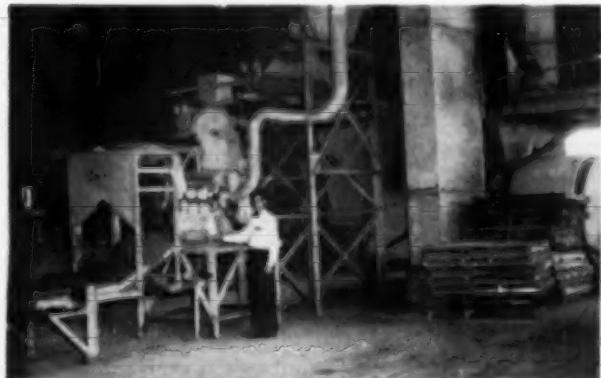
The fertilizer and mixing concern of Lloyd Newell, Inc., Lancaster, Calif., was organized in 1930 to sell at retail: feeds, seeds, fertilizer and other agricultural supplies. By 1941, the business had grown and diversified to the point where a separate concern, Newell & Co., was organ-

ized to handle the retail sales, and Lloyd Newell, Inc. has since engaged in mixing fertilizers and feeds, the wholesale end of the business. Lloyd Newell is president, and M. E. Trammell is fertilizer sales manager and also secretary-treasurer of the corporation. Lloyd Newell, Inc., markets a complete line of insecticides, simple fertilizers, feed, and the Antelope Valley brand mixed fertilizers. A one-ton Westco dry mixer is used in the mixing plant.

AFC, Inc. is located in Edison, about eight miles east of Bakersfield, and the area in which the earliest shipments of early spring white rose potatoes originate. Owned and operated by James Bonaventura and Frank Waterman, AFC conducts a dry mixing business. They operate a liquid fertilizer mixing business, on the same premises under the name of B & W, Inc.

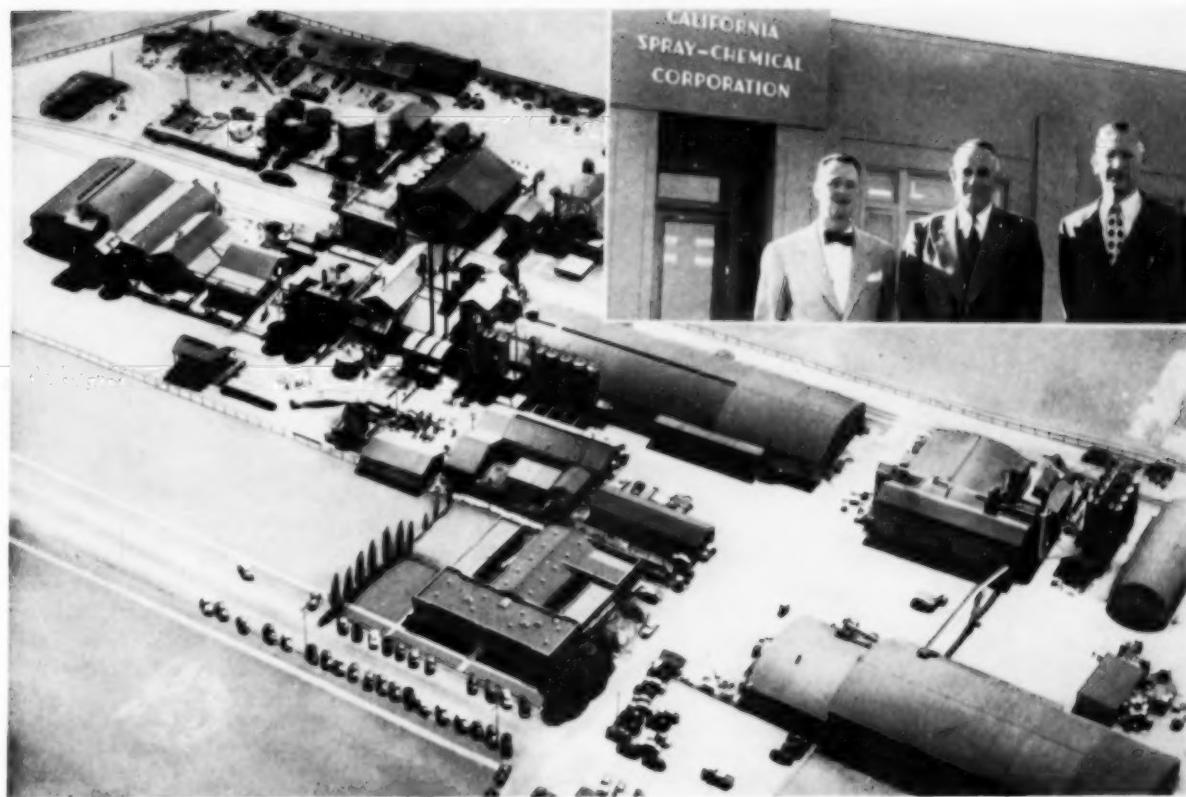
The name AFC consists of the first letters of the words "Agricultural Fertilizers and Chemicals." The new Hewitt-Robbins dry mixing plant of 40 tons per hour capacity is located in a new 100' x 200' building, located on a railroad siding in

John Parker, manager Fresno Agricultural Chemical Co. They operate a Sturtevant dry mixing plant and St. Regis bag packer.



A field tank leaves the plant of Agro Phosphate Co., Tulare County, California





which are situated twelve bulk storage bins with a total capacity of 8,000 tons of material. A screw conveyor with shuttle belt permits bulk unloading from car or truck and direct movement to any bin. Bulk mixed fertilizer can be loaded for delivery to the applicators in the field by mobile units. Bagging equipment can turn out 45 tons of material each hour. The plant is equipped for ammoniating superphosphate. There

Plant of California Spray Chemical Corp. Insert, left to right: C. E. Cody, A. W. Mohr, and E. W. Cannon.

is a unit for converting anhydrous ammonia to 25,000 gallons of aqua ammonia per day. A complete line of insecticides is also manufactured and distributed.

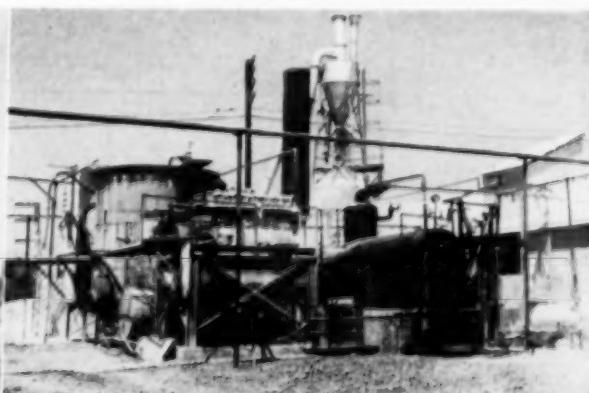
Beebee Fertilizers, Inc., Shafter, known formerly as Brown and Bry-

ant, mixes and distributes fertilizers for the use of Kern County farmers. Ed A. Brown is president, Fred Bryant is vice-president, and Vernon Wilson is secretary-treasurer. Kern County is a top producer of cotton, potatoes, grapes, alfalfa and many other crops. Beebee operates a dry mixing plant of 60 tons per day capacity, and is served by both rail and truck. It has a new unit for converting anhydrous ammonia to

Ammonia converting plant of Beebee Fertilizers Inc., Shafter.



Liquid and mixed fertilizers are manufactured in the plant of Agriform Co., Wasco.





**Left:** H. D. Stephenson, general manager of Modern-Ag Crop Service, Fresno. The plant is equipped for mixing liquid fertilizers.



**Right:** An 80-ton per day capacity Sturtevant dry mixing plant is operated at Madera by Naco Fertilizer Co. M. DiGregory is manager.

25,000 gallons of aqua ammonia per day.

The Wasco and Corcoran plants of Agriform Company, Inc., mix and distribute liquid fertilizers. Vice-president, D. W. Galbraith reviewed some of the history of Agriform, pointing out that in the fall of 1945, L. P. Hall and J. N. Galbraith went into the fertilizer business in Santa Ana as partners. A small liquid mixing plant was erected there, and delivery of the first material, under the trade name of "Nutrisol" liquid fertilizers, was made in June, 1946, for application to citrus orchards in the irrigation water. A tank trailer for delivery, and application equipment were developed a little later, forming the nucleus of a custom service which has since expanded greatly. In September, 1946, the firm was incorporated under its present name. Since that time, additional

"Fresno" brand mixed fertilizers are formulated by Emco Co., Fresno.

liquid mixing plants have been installed at Holtville, Imperial County; Pasco, Washington (Partnership with Lyle Neff); Phoenix, Arizona (Mari-copa Chemical Company, a wholly-owned subsidiary); Yuma, Arizona (Atmar distributors in partnership with Joe Atmar). Sub-stations for handling bulk liquids are at Arvin, Button Willow, Corcoran and Cal-patria.

Complete soils and tissue testing laboratories are in operation at Santa Ana, Wasco and in the Imperial Valley, providing service to growers in those areas. An aqua ammonia converting station was installed at Corcoran in 1952, with 1,000 tons storage capacity.

Insecticide mills are in operation at Holtville and Wasco, and a sulfur grinding plant at Wasco. "Agritox" is their brand name. Calcium polysulfide units are located in Wasco and Phoenix. A solution-type cotton defoliant is manufactured at Wasco, Holtville and Phoenix, and is market-

ed under the name "Agrifoliant." Agriform Company, Inc. services California, Arizona, Colorado, Utah, Washington and Old Mexico.

The new plant of Agro Phosphate Co. is located in Tulare County. This concern, one of the largest liquid fertilizer concerns in the West, was originated in 1938 by Walter Standee and Gordon Greening, and pioneered the application of phosphoric acid to the soil. Much research and experience went into the development of procedure now in use for delivering and applying, both in irrigation water and by injection. Several patents are owned by Agro-Phosphate Co. Shortly after the phosphoric acid application work, they developed procedures for applying liquid ammonium nitrate and ammoniated ammonia nitrate.

Agro-Phosphate Co. is California distributor for "Anaconda"

Exterior view of the Madera plant of Naco Fertilizer Co.





**Left:** Bruce Graves,  
manager of Orange  
Belt Supply Co.



**Right Top:** Lloyd  
Newell, president of  
Lloyd Newell, Inc.  
and M. E. Trammell,  
fertilizer sales mgr.

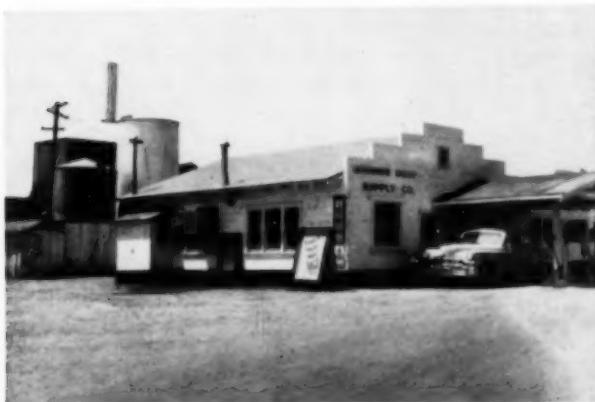


**Right Bottom:** Sun-  
land Industries, Inc.,  
Fresno; left to right:  
Frank Easton, gen-  
eral mgr.; E. Cun-  
liffe, sales manager;  
B. H. Jones, presi-  
dent; A. Carey, mgr.  
of fertilizer dept. and  
Dr. G. MacLeod, vice-  
president.

phosphoric acid in liquid form. Ammonia nitrate solutions and the ammoniated product are obtained from Hercules Powder Co., Phillips Chemical Co. and Spencer Chemical Co. Storage depots are maintained in Imperial, Blythe, Coachella, Norwalk, Visalia, San Joaquin, Salinas and Tracy, California, and Arizona. The company has manufactured its own storage tanks, stainless steel field tanks and application equipment, since this was a new type of fertilizer distribution involving corrosive liquids. Equipment developed allows application direct to the field of any mixture desired, and also to change the proportion of any material in the mix in any portion of the field, as desired.

In the heart of the Tulare County citrus, olive and cotton producing area, is the modern dry mixing plant of the California Spray-

Exterior view of Orange  
Belt Supply Co., Lindsay.



MAY, 1954

Chemical Corp., located on the southern outskirts of Lindsay. This is, at the present time, Cal-Spray's only dry fertilizer plant, although a smaller volume of liquid material is manufactured at Richmond. Richmond is the head office of Cal-Spray, which manufactures and distributes "Ortho" brand pesticides all over the U. S. and in Canada, Puerto Rico, Mexico, South America, France and England.

There is an interesting story behind the fertilizer operation of Cal-Spray. Howard Houston was one of the first representatives of this concern in California's agricultural area,

having been first identified with the company in 1922. In 1932 he became the exclusive sales representative for the counties of Tulare and Kern. In 1937 he established a fertilizer business in Lindsay under the name, Mid-State Chemical Supply, this being separate from the Cal-Spray line of pesticides which Houston continued to represent. In 1946 a new fertilizer mixing plant and warehouse was constructed at Lindsay. In 1947 the fertilizer concern

(Turn to Page 110)

Aerial view of Sunland  
Industries, Inc., Fresno.



*Sound  
Practices  
in  
Cost  
Accounting  
for the*

## **AGRICULTURAL CHEMICALS INDUSTRY**

**I**n a period of weak demand and corresponding downward pressure on prices, every company is faced with a relatively clear-cut choice. Should you attempt to maintain volume by reducing prices, or should you maintain prices and reconcile yourself to some reduction of volume? Obviously, the answer to that question will have a direct and significant effect on your profits.

It is surprising how many people in these circumstances tend automatically to think in terms of cutting prices in order to maintain volume. Actually, in many cases, you may show better profits by maintaining prices and reducing volume. This statement, of course, is true only within limits. If volume is reduced enough, substantial losses can result. And this could happen if a single manufacturer held his prices constant while his competitors reduced their prices.

Nevertheless, we can agree, I think, that there is more than one side to the question: Should we maintain volume by cutting prices or should we maintain prices and reduce volume? It is equally important to realize that sound cost accounting practices will enable you to investigate each individual situation in terms of the dollar effect on profits resulting from each course of action.

### **Profit Planning**

To make clear what this means, let's take a look at a simplified profit projection for an agricultural chemi-

cals manufacturer (Table I). If you look at the relationship of material costs to sales income, you will see that it is typical of the cost picture of a nonintegrated producer. That is, the relative cost of materials in relation to sales indicates that this company is making pesticides from materials bought on the outside.

These figures could be changed to exemplify an integrated producer simply by reducing the relative cost of materials and correspondingly increasing the other elements of cost. Therefore, the comments I am about to make will apply to both integrated and nonintegrated companies, and will differ in their application only in degree.

This set of profit projections presents an original profit plan and two possible changes from the original profit plan. Of the two changes, the first reflects a reduction in sales volume of 10 percent, but no reduction from the originally planned selling price. The second variation reflects a volume unchanged from the original plan, but the selling price is reduced 10 percent from the originally planned selling price.

Now let's look at the most interesting part—at the bottom, where it says "profit." This business can plan a profit before taxes of \$50,000 or \$35,000 or zero—depending on volume and price factors. The \$50,000 is based on originally planned volume and price. The \$35,000 is based on a reduction of 10 percent in volume, with selling price held

constant. The zero profit is based on originally planned volume, but reducing selling price 10 percent.

Looking at "Income from Sales," we note that the original plan calls for \$500,000. A 10 percent change in either volume or price will of course result in a reduction of sales income to the \$450,000 shown.

Looking next at costs, you will notice that they are divided into variable costs and fixed costs. Variable costs increase or decrease directly with the volume of production and sales. Please notice that materials and supplies, variable labor, variable power, and packages change in this example as volume changes. When volume drops 10 percent from \$500,000 to \$450,000, then total variable costs also drop 10 percent from \$330,000 to 297,000.

Fixed costs include supervision, selling expenses, fixed portions of labor and power, and the overhead represented by office expenses, local taxes and insurance, and depreciation. Fixed costs are those costs for which you are more or less committed, regardless of the volume of sales or production. In this example, the total of fixed costs remains at \$100,000 regardless of volume or selling price changes.

Now let's go back and put sales and costs together to arrive at profits. If we read down the column headed "Items of Income and Cost," we

\*Before Spring Meeting National Agricultural Chemicals Association, Houston, Texas, March 26, 1964.

*By Wilson J. Seneay\**

McKinsey & Co.  
New York, N. Y.

find that sales income less freight and less variable costs equals marginal return. In the original plan, \$500,000 sales income less \$20,000 freight, less \$330,000 variable costs results in a marginal return of \$150,000.

Fixed costs of \$100,000 are subtracted from the marginal return to arrive at a profit before taxes of \$50,000. Assuming normal tax rates, this leaves a profit after taxes of \$29,500.

#### Alternative Courses

Now let's suppose that some time after the original plan has been prepared, economic conditions and market demands change. There is a downward pressure on prices, and there is no strong demand for the product. The producer is faced with a choice of holding his selling price constant and reducing volume, or of reducing selling price and maintaining volume. The planned profit results of these alternative courses of action are quickly spelled out.

If price is held constant, and a 10 percent loss in volume is incurred, sales income is reduced 10 percent to \$450,000. Variable costs are likewise reduced 10 percent, so that freight is only \$18,000 instead of \$20,000. Similarly, the plant variable costs become \$297,000. This results in a marginal return of \$135,000. In other words, sales income is down \$50,000, but this is offset by a reduction of \$35,000 in variable costs; so that the net reduction in marginal return is only \$15,000. The

fixed costs subtracted from marginal return remain the same, so that the net reduction in profit before taxes is also \$15,000. Thus, we forecast that a reduction in volume of 10 percent at a constant selling price results in a reduction of profit before taxes of \$15,000 or after taxes of \$7,200.

Now let's look at the planned profit results of the alternative of reducing selling price 10 percent and holding volume constant. Again, income from sales is \$450,000. However, there is no reduction in variable costs, because there has been no reduction in volume. Therefore, freight and variable plant costs remain as they were in the original plan, and that is \$20,000 and \$330,000 respectively. Marginal return now becomes \$100,000. Since marginal return and fixed cost are now equal to each other, profit before taxes is zero. Thus, if this second alternative is followed, reduction in profit before taxes is a full \$50,000.

Probably the conclusions to be drawn from this example are not new. There is nothing startling in the news that lower price or lower volume frequently means lower profits. However, even when "everybody knows the answer," it is often difficult to get the proper dollar signs on these answers which "everybody knows." The significant thing about this example to me is that specific alternatives can be quickly measured in specific dollar terms. This is something that cannot be done in many accounting systems.

#### Sound Cost Accounting

What sort of cost accounting practices are best suited for answering this and other profit planning problems? There are three guides to sound accounting for profit planning:

1. Keep your reports and records simple and easily understandable.

(Continued on Page 129)

TABLE I  
Planned Profits — Agricultural Chemical Sales

Items of Income and Cost	Original Plan	POSSIBLE CHANGES	
		Volume Down 10% Selling Price Constant	Volume Constant Selling Price Reduced 10%
Income From Sales	\$500,000	\$450,000	\$450,000
Less: Freight	20,000	18,000	20,000
	\$480,000	\$432,000	\$430,000
Less Variable Costs:			
Materials & Supplies	310,000	279,000	310,000
Variable Labor	8,000	7,200	8,000
Variable Power	2,000	1,800	2,000
Packages	10,000	9,000	10,000
	\$330,000	\$297,000	\$330,000
Marginal Return	\$150,000	\$135,000	\$100,000
Less Fixed Costs:			
Supervision	25,000		
Selling Expenses	35,000		
Fixed Labor	8,000		
Fixed Power	2,000		
Office	5,000		
Insurance	10,000		
Depreciation	15,000		
	\$100,000	\$100,000	\$100,000
Profit Before Taxes	\$ 50,000	\$ 35,000	\$ -0-
Federal Income Tax	20,500	12,700	-0-
Profit After Taxes	\$ 29,500	\$ 22,300	-0-

## BORATE AND CHLORATE HERBICIDES

**S**ODIUM chlorate was established as an herbicide (2, 3, 9) about 10 years prior to the intensive investigations by research teams of the California Agricultural Experiment Station (4, 5, 11), which established the borates and borate/chlorate mixtures as efficient soil sterilant herbicides. The literature reporting observations and experiments on the toxic effect of boron on crop and weed plants published previous to 1936 is reviewed by Crafts and Raynor (5) as an introduction to their early investigations.

While the consumption of borates and borate/chlorate mixtures as herbicides for control of weeds in agricultural areas has increased steadily over the past 10 year period, their use as soil sterilants on industrial sites, on petroleum installations, along highways, and by power and communication line systems now far exceeds the agricultural demand.

Early investigations (10, 11, 12) and wide field applications of borates as herbicides were undertaken with common borax ( $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ ), which is relatively low in boron (11.35%) or boron trioxide (36.5%), and poorly soluble (about 5 parts per 100 in water at 68°F.). Other studies used crude borate ores of low boron trioxide content. In recent years, commercial producers have developed a number of highly concentrated borate herbicides with a wide range of efficient applications in agriculture and industry. Borate herbicides composed of sodium-calcium borate ores (below)

Gerstley Borate—a mixture of Ulexite ( $\text{NaCaB}_3\text{O}_6 \cdot 8\text{H}_2\text{O}$ ) and Colemanite ( $\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 9\text{H}_2\text{O}$ ) or calcium ore (Colemanite) of low solubility—slow to leach and having long residual toxicity in soils of high rainfall areas—and concen-

trated sodium borate ores with  $\text{B}_2\text{O}_3$  content of 62.65% are available for dry hand or machine application, or for applications as slurries. Highly soluble, sprayable borate-chlorate mixtures are now compounded of sodium pentaborate ( $\text{Na}_2\text{B}_10\text{O}_{16} \cdot 10\text{H}_2\text{O}$ ) with a  $\text{B}_2\text{O}_3$  content of 58.9% (B—18.33%) and solubility of 15% by weight in water at 68°F; or using polyborates which have a  $\text{B}_2\text{O}_3$  content of 66.0% (B—20%), and solubility of several pounds per gallon of water at field temperatures. In addition, sodium pentaborates and polyborates have high fire retardant characteristics—an important consideration in mixtures with chlorates used on industrial sites.

These improvements in formulation and efficiency of borate herbicides, which have given the consumer a reduced unit cost for weed control, have concurrently developed confusion and uncertainty as to the practical evaluation of the qualities of various formulations of the straight borate, or the borate/chlorate herbicides now available commercially from a growing number of formulators. Public fund purchasers, agents of industrial enterprises, and field applicators need a simple factor common to all borate herbicides on which to base efficiency and cost economy of competitive products. Further, this value factor common to all borate herbicides should be related numerically to a unit value of efficiency of sodium chlorate.

Borates and chlorates are recognized to have certain unique characteristics, which are summarized in the publication "Weeds of California" (12). In a section defining permanent soil sterilants as "those which last longer than one year in the soil

following normal applications", the report indicates:

"(a) Sodium chlorate ( $\text{NaClO}_3$ )  
Applied dry, usually at rates of 3 to 8 lbs. per square rod. Leaches readily, high toxicity, decomposes rather rapidly. Less effective on soils high in nitrate. Some species resistant. Fire hazard."

"(b) Boron compounds (Borax,  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ )  
All boron compounds toxic in proportion to borate ion. Fixed in clay soils, leaches slowly, soil fertility of little importance. Slow acting. Many species relatively resistant. Usually 10 to 20 lbs. per square rod applied dry. Cheap."

An analysis of these recommendations for sodium chlorate and borate compounds indicates that when the recommended rates in pounds of borax are converted to  $\text{B}_2\text{O}_3$  content, the range and average rate of recommendations of sodium chlorate and boron trioxide are almost identical and equal. Conversion of average recommendations as borax to elemental boron equivalents gives a less handy factor—1 lb. of elemental boron equivalent being equal to approximately 3.2 lbs. of sodium chlorate.

In considering the borate/chlorate mixtures, and again referring to the above publication, the authors list as a recommendation:

By  
J. D. Stone  
and  
L. M. Smith

Pacific Coast Borax Consolidated  
Los Angeles

"(a) Combinations of Sterilants

(1) Chlorate plus borax

Good, high initial toxicity of chlorate and persistence of borax lessens fire hazard. Two lbs. Na ClO<sub>3</sub> plus 8 lbs. borax per square rod."

Here again, the reference is to borax with a B<sub>2</sub>O<sub>3</sub> content of 36.5%, whereas, at the present time borates used in these combinations are in the penta-borate range with B<sub>2</sub>O<sub>3</sub> content of 58 to 66%. Conversion of the above recommended proportions of chlorates and borates in the herbicidal mixture on the basis of boron trioxide equivalent of the presently used forms of borates will give a relative proportion of the two compounds close to 1.0 lb. sodium chlorate to 2.5 lbs. pentaborate. A ratio of ingredients of 1 to 3 is common in most commercial formulations.

The recommendations indicated above are similar to those published by Litzenberger of Montana in 1941 (10) and by workers of other state experiment stations in the past 10 years. A recent publication of the Research Committee of the NCWCC (1) shows a definite trend in the north-central states and western Canadian Provinces, toward the use of boron trioxide content of borates, or mixed borate/chlorate herbicides, as a standard measure of efficiency of the borate in the herbicide. These late recommendations further recognize the efficiency of the 3 to 1 borate/

chlorate mixture in recommendations for control of a number of perennial weeds. In the case of certain perennial weeds, this publication recommends the use of sodium chlorate or the borate/chlorate mixtures at equivalent rates per unit area, and further, recommends the use of straight borate compound on the basis of boron trioxide content being equivalent pound for pound to sodium chlorate for perennial weeds, such as leafy spurge (*Euphorbia esula*).

On the basis of a review and study of the literature presenting research results and recommendations for use of borate and borate/chlorate mixtures, we undertook a greenhouse investigation to verify two points on which the investigators have generally agreed, and which may serve as convenient and valid comparative values by which formulators as well as purchasers and consumers may evaluate the potential herbicidal efficiency of borates vs chlorates, and relative borate/chlorate content of mixed formulations as herbicides. The specific problems of this investigation are:

1. Can the B<sub>2</sub>O<sub>3</sub> content of borate herbicides be conveniently and validly compared in equivalent numerical units to sodium chlorate as a plant poison?
2. In borate/chlorate mixtures as herbicides is the present widely formulated and recommended 3 to 1 ratio as efficient as formulations with a higher chlorate and reduced borate content?

Procedures

**S**eedlings of a number of plants selected for their reported relative range of tolerance or susceptibility to borates and chlorates (6, 8, 14) were used in greenhouse tests. Plants used included oats, alfalfa, sweet clover, beans and zinnias. In order of reported tolerance to boron and sodium chlorate, these crops rank as indicated in Table I. Seeds of these crop plants were grown in standard steel bread pans filled with vermiculite, to which the desired concentrations of the several herbicidal compounds tested were added as a water solution. A standard nutrient solution (7) was added to the pans at the first watering after emergence of

the seedlings. Moisture level in the vermiculite was maintained otherwise by the addition of distilled water. Minimum night temperature was 65° F., maximum day temperature was 95°. Twelve hours of light and 12 hours of darkness were maintained. Six replications of 100 seedling samples were used. Plot treatments included sodium chlorate, B<sub>2</sub>O<sub>3</sub> derived from soluble sodium polyborates, and borate/chlorate mixtures composed of 25% sodium chlorate and 75% sodium polyborates (hereinafter referred to as Compound C); and 40% sodium chlorate and 60% sodium polyborates (hereinafter referred to as Compound D), respectively. Each was compared at concentrations in the original water solution following planting of the crop seeds at 0, 10 ppm, 100 ppm, and 1000 ppm, respectively. Additional test concentrations of 500 ppm and 750 ppm were used on oats. In these solutions beans were allowed to grow for 10 days following emergence—all other crops 16 days after emergence. The plants were then removed from the vermiculite media, the roots freed of vermiculite granules and the green weight and oven-dry weight of plants in each plot determined. Efficiency of the herbicides at several concentrations was then calculated on the basis of percentage of reduction of growth increment using the 0 treatment weight as a standard check. In the following discussion of these data, green weight increment is used.

In planning this investigation, no attempt was made to evaluate any of the factors of herbicidal efficiency other than the relative toxicity of comparable concentrations of the several herbicides to the seedlings of the plants selected on the basis of their reported range of reaction to borates or chlorates. It is recognized that relative boron toxicity is markedly affected by textural grade (clay content) of the soil under field conditions, and that relative chlorate toxicity is closely associated with fertility level (nitrate level) (4). In the investigations reported here, the effect of colloids on the availability of the boron was eliminated by choice of the culture media used and variables

## THE "NIGHTCAP" WITH A KNOCKOUT



# GEIGY

## METHOXYCHLOR

FORMULATIONS

*they're positively deadly to bugs!*

Ever see a covey of bugs fly unscathed through a cloud of insecticide like they had radar? Or see them shake off a direct hit and amble away unharmed and unconcerned? That's the time to start specifying GEIGY METHOXYCHLOR, the chemicals that are positively deadly to pests but relatively safe to human beings and animals.

GEIGY METHOXYCHLOR products are effective for fly control, storage pests and for fruit, vegetable and forage crops. They are available as the following:

### GEIGY METHOXYCHLOR "25E"

(25% emulsifiable solution—  
2 lbs. methoxychlor per gal.)

### GEIGY METHOXYCHLOR "90"

(90% methoxychlor)

### GEIGY METHOXYCHLOR "20"

(20% methoxychlor solution)

### GEIGY METHOXYCHLOR "50"

(50% methoxychlor wettable powder)

### GEIGY 5% METHOXYCHLOR DUST

ORIGINATORS OF



DDT INSECTICIDES

GEIGY AGRICULTURAL CHEMICALS • Division of Geigy Chemical Corporation • 89 BARCLAY ST., NEW YORK 8, N. Y.

Aberdeen, N. C.; Burlington, Iowa; Elkton, Md.; Fresno, Calif.; Houlton, Me.; Leland, Miss.; McGregor, Tex.; Orlando, Fla.; Yakima and Walla Walla, Wash.

associated with the action of chlorate were eliminated by using only one level of fertility which was that recommended by Hoagland (7) for normal, vigorous growth of plants in culture media. In the application of the above results of this investigation to field practice, both of these factors are important considerations.

#### Data and Discussion

**F**IGURE I presents graphically the reactions of five species of plants to the concentrations of herbicidal chemicals tested. Data for each concentration represent the average growth increment expressed as a percentage of that determined for the untreated, but otherwise comparable, checks. Data were treated statistically for the analyses of variance (13).

The coefficients of regression are indicated for each chemical tested with the graph of the reaction of several crops. By selecting the several concentrations used in this investigation, this conversion permits a highly usable and understandable picture of the response of test plants to the range of concentrations used. Also, in using this analysis of data, the performance of any concentration between 10 ppm and 1000 ppm can be predicted fairly accurately by selecting the desired concentration point on the regression lines. It should be emphasized that in a study of regression line graphs, the degree of slope of the regression line is a positive indication of the concentration-toxicity value; and the degree of separation of regression lines at any selected point on the Y axis for the several chemicals used in this investigation can be directly interpreted as difference in response of a specific plant to the toxic action of the chemicals being compared. From these various considerations, plotting the data as regression lines offers several advantages in making a quick comparison of the toxicity of the herbicidal materials of interest.

The graphs for oats in Figure I first demonstrate that all of the materials tested as herbicides in this investigation give almost identical response of this plant in concentra-

(Continued on Page 131)

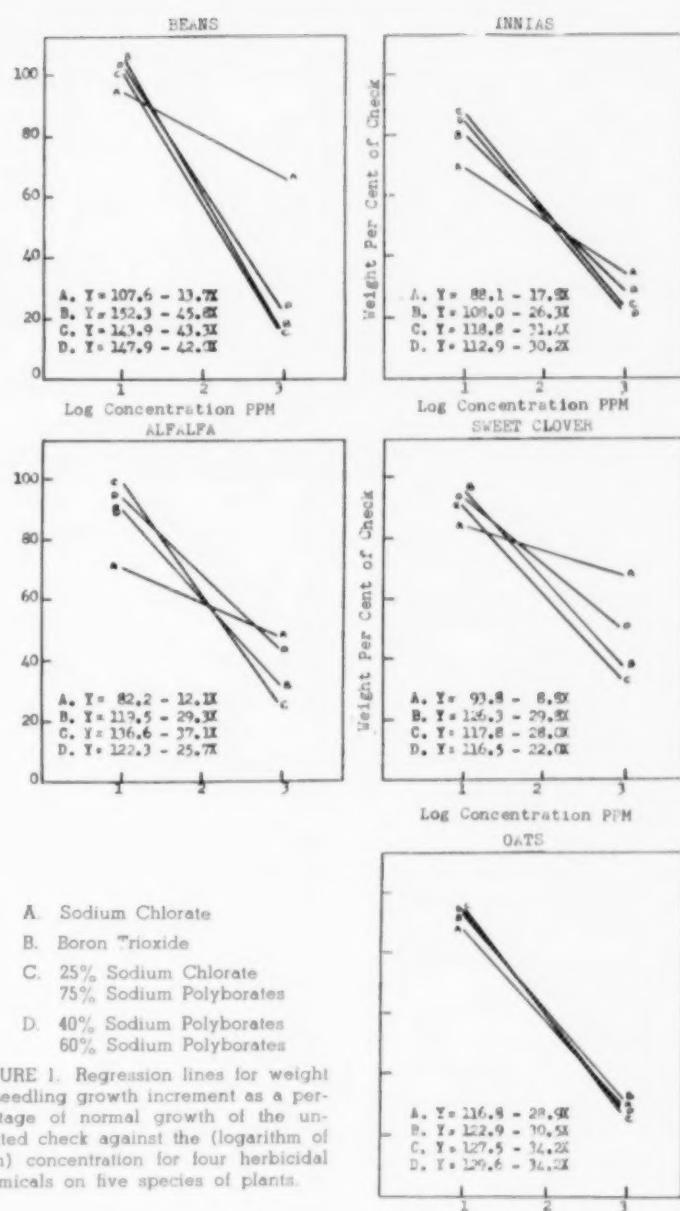


FIGURE 1. Regression lines for weight of seedling growth increment as a percentage of normal growth of the untreated check against the (logarithm of ppm) concentration for four herbicidal chemicals on five species of plants.

TABLE I

Crop Plants	Tolerance to <sup>a</sup> Sodium Chlorate	Tolerance to <sup>a</sup> Borates
Sweet Clover ( <i>Mellilotus indica</i> )	Tolerant (8) Sensitive (14)	Tolerant (6)
Alfalfa ( <i>Medicago sativa</i> )	Semi-Tolerant (8)	Semi-Tolerant (6)
Oats ( <i>Avena sativa</i> )	Tolerant (8) Semi-Tolerant (14)	Semi-Tolerant (6)
Kidney Beans, Navy ( <i>Phaseolus vulgaris</i> )	—	Sensitive (6)
Zinnias ( <i>Zinnia elegans</i> )	—	Sensitive (6)

<sup>a</sup>Numbers in parenthesis refer to literature cited in text.

**A**MERICAN agriculture may soon be employing antibiotic weapons against plant diseases. That is the hope held out by noted antibiotic authorities who spoke before the 11th annual meeting of the Potomac Division, American Phytopathological Society at the U. S. Department of Agriculture's Plant Industry Station, Beltsville, Md., March 3-4.

F. C. Visor of Charles Pfizer and Co., New York, who summarized the experimental successes that have been achieved with antibiotics against fruit and vegetable diseases, predicted that these new materials will enjoy a promising future in plant disease control.

Dr. B. M. Duggar, of Lederle Laboratories and discoverer of aureomycin, described the methods for finding and isolating antibiotics. He said there were several relatively simple ways of obtaining antibiotics from such sources as the soil.

J. D. Garber, Merck and Co., Rahway, N. J., discussed the chemistry of antibiotics that have shown ability to combat plant diseases, including such common "wonder drugs" as penicillin and streptomycin, and less well known materials such as bacitracin, gliotoxin, griseofulvin, Actidione, and clavacin.

Henry Welch, director of the antibiotics division of the U. S. Food and Drug Administration, who discussed the residue problem likely to be created by use of antibiotic sprays and dusts as they have been used experimentally on fruit for blight control, said that "it would appear unlikely that significant quantities (of antibiotic residues) will be found in the fruit at harvest."

Mr. Visor stressed the need for thorough investigation of this new potential as another means of reducing the \$3 billion annual plant disease loss—about one-fourth of which is caused by bacterial diseases. For the first time in history, he said, there now appears a promising means of controlling fire blight, one of the most important economic bacterial diseases. Since 1951, tests with streptomycin and with combinations of streptomycin and terramycin at Mis-

souri, Delaware, and Ohio State Universities have shown that 100 percent control of fireblight can be achieved under field conditions.

Most recent investigations reported on by Mr. Visor were those carried out this past year at Ohio Agricultural Experiment Station. There, use of three antibiotic sprays at blossom time on apple trees provided 97 percent control of fire blight infection of blossoms and 100 percent control of twig infection when streptomycin was used at the rate of 120 ppm. Terramycin at 120 ppm gave 91 percent blossom blight control; 99 percent twig blight control. Use of streptomycin on pears by both USDA and University of California research workers in 1953 provided good fire blight control.

Mr. Visor also reported on the antibiotic resistance problem: the ability of certain disease organisms to withstand increasingly larger doses of antibiotics. In the Pfizer laboratories, eleven streptomycin treatments (at 2 ppm) against two different strains of the fire blight disease organism resulted in a 15-fold increase in resistance to treatment. However, when 1 percent terramycin was added to the streptomycin, 13 treatments of fire blight resulted in only 2½-fold increase in resistance. Addition of 10 percent terramycin allowed 21 treatments before the 2½-fold resistance level was reached with one fire blight strain, and with the other strain, no increase in resistance

after 29 treatments.

Residue assays carried out in the Pfizer Co. laboratories with field treated apples showed the presence of streptomycin in the natural acid materials of the fruit, but neutralized apple juice mash showed presence of neither streptomycin nor terramycin. Both antibiotics had been applied against *Bacillus subtilis*, highly sensitive bacterial organism.

Residues from tomato plants sprayed three to five times with streptomycin and agrimycin (at rates of 100 and 200 ppm) showed no antibiotic activity when assayed. Similarly, sprays of streptomycin used at rates ranging from 60 to 500 ppm to knock out a bacterial spot infection of pepper plants at the Delaware Agricultural Experiment Station, left no demonstrable residues on pepper fruits, Visor said.

Dr. Duggar said that the soil is the principal source of organisms producing antibiotics, but that some are parasitic on animals, others are found in lesions of one kind or another, and at least one genus is distributed on weeds growing in water.

A simple process described by Dr. Duggar for obtaining actinomycetes involves preparation of dilution cultures from soil suspensions. Unwanted organisms are eliminated by centrifugation and heat. The next step, Dr. Duggar said, is to select from dilution plates the colonies desired by noting inhibition zones and to make an ordinary agar slant cul-

**POTOMAC**

# **PHYTOPATHS HOLD CONFERENCE**

*By Paul Miller*

**Top Photo: Officers** Left to right, W. J. Zaumeyer, Beltsville, councilor; J. W. Heuberger, Univ. of Del., Newark, Del., president; H. R. Thomas, Beltsville, vice-president; and L. W. Weaver, Univ. of Maryland, College Park, Md., secretary-treasurer.

**Bottom Photo: Symposium Panel:** Left to right, J. D. Garber, Merck & Co., Rahway, N. J.; B. M. Duggar, Lederle Laboratories; H. Welch, U. S. Food and Drug Administration; F. C. Visor, Chas. Pfizer & Co.; and W. J. Zaumeyer, Beltsville, chairman of the symposium.



ture of this material. Antibiotic value of the selected and cultured material can be determined by assay, and comparing the assay results against a number of known organisms. Once antibiotic organisms have been isolated, the antibiotic can be increased by fermentation processes, Dr. Duggar said.

Dr. Garber diagrammed the organic chemical structure of about a dozen antibiotics. Included were gliotoxin, which has been used against *Cercospora* leaf spot of tobacco; griseofulvin, which unlike most antibiotics, is stable in acid soils; clavacin, of relatively simple structure that is produced by a large number of fungi; musarin, which has been used against banana wilt disease; and thiolutin, thioaurin, and aureothricin, all similarly complex anti-fungal agents.

Dr. Garber described the more familiar streptomycin, terramycin, and aureomycin as quite stable. Terramycin and aureomycin are related,

he said, both being active against gram-positive and gram-negative virus diseases and against protozoa.

Dr. Garber discussed the limited degree of variation in structure that is possible with streptomycin, penicillin, chloromycetin, and tetracycline derivatives without altering their biological activity. He also pointed out the synergistic effects (increased bacterial destroying activity) sometimes achieved by using two narrow spectrum antibiotics (bacitracin, neomycin, penicillin, or streptomycin) together, and the antagonism that is produced when a narrow spectrum is used with one of the broad spectrum types such as aureomycin, terramycin, or chloromycetin.

Mr. Welch, of Food and Drug Administration, said that it is likely that antibiotics used in plant disease control will classify as pesticides rather than as drugs. This means they will not come under the drug regulations of the Food, Drug, and Cosmetic Act, which considers addition of chemicals to food as adulterations, but will be under the regulations of the Federal Insecticide, Fungicide, and Rodenticide Act administered by the U. S. Department of Agriculture. He said that the determination of usefulness of antibiotics as pesticides rests with USDA, the authority on plant diseases.

With expansion of this new and economically important use of antibiotics comes the problem of establishing tolerances for the use of these drugs as pesticides, as a protection of the public health. Mr. Welch said that although the Food, Drug and Cosmetic Act includes administrative processes through which tolerances can be established, the formal public hearings that are required, and the detailed finding of facts and conclusions necessary will make tolerance establishment a long and arduous procedure.

Mr. Welch called attention to the Miller bill (H.R. 7125) introduced into the second session of the 83rd Congress to amend the Food, Drug and Cosmetic Act, and passed by the House of Representatives early in April. Prime purpose of the Miller bill is to provide better protection of the public health and speed up administrative processes for establishing tolerances for pesticide residues. Changes accomplishing these objectives would be of considerable value to agriculture, Mr. Welch indicated. ★★

---

## Antibiotics used in plant disease control may classify as pesticides rather than drugs; will be under regulations of Federal Insecticide, Fungicide and Rodenticide Act.

---

Whatever the amount of toxicant  
in your concentrate...  
there's a matched  
**ATLOX® emulsifier!**



An emulsifier that works fine at 4 pounds of toxicant per gallon may not be right at 8 pounds per gallon. The difference in the toxicant used in a concentrate makes a big difference in the emulsifier requirements of the formula. For best results, an emulsifier should be *matched* to the amount of toxicant . . . the solvent used . . . and other vital factors listed below.

You can make better emulsifiable concentrates by bringing your emulsifier problems to Atlas. As a result of many years of close cooperation with leading formulators, Atlas has developed a wide variety of Atlox® emulsifiers, and a storehouse of technical experience in applying them to agricultural chemicals.

We've outlined in the check list below the most important factors involved in choosing emulsifiers. Just fill in the data for your specific application, and send it to us. We'll be glad to suggest a matched Atlox emulsifier or emulsifier blend that's exactly fitted to your product.

#### EMULSION DATA CHECK LIST

1. Toxicant used \_\_\_\_\_
2. Solvent used \_\_\_\_\_ ppm.
3. For water hardness \_\_\_\_\_
4. Recommended dilution \_\_\_\_\_
5. Lbs. toxicant/gal. of concentrate \_\_\_\_\_
6. Desired emulsion stability \_\_\_\_\_
7. Shelf life expected \_\_\_\_\_
8. Ease of dispersion important? \_\_\_\_\_
9. Packaging: bulk \_\_\_\_\_ or small container \_\_\_\_\_
10. How is concentrate mixed and evaluated in laboratory tests? \_\_\_\_\_



CHEMICALS  
DEPARTMENT

**ATLAS**

POWDER COMPANY

WILMINGTON 99, DELAWARE  
offices in principal cities

ATLAS POWDER COMPANY, CANADA, LTD.  
BRANTFORD, CANADA

# NFA

**ANNUAL MEETING - JUNE 14-16  
GREEN BRIER HOTEL  
WHITE SULPHUR SPRINGS**

**S**ECRETARY of Agriculture Ezra Taft Benson and Congressman W. Sterling Cole, chairman of the Joint Committee on Atomic Energy of the U. S. Congress, will be the principal speakers at the annual spring convention of The National Fertilizer Association at the Greenbrier Hotel, White Sulphur Springs, West Virginia, June 14-16.

Other features of the program, according to Russell Coleman, NFA president, include symposia on sales development and on the granulation process in the production of fertilizer. The NFA's Plant Food Research Committee has scheduled several panels in the symposia. Moderator of the panel on sales development will be

H. H. Tucker, Coke Oven Ammonia Research Bureau. Edwin C. Kapusta, NFA's chemical engineer, will moderate the panel on granulation.

The annual election will choose directors of the association to succeed members of the board whose terms will have expired. Following the last general session on Wednesday, June 16, the new board of directors will hold an organization meeting for the purpose of electing officers for the coming year. Present officers are: chairman of the board, Louis Ware, president, International Minerals & Chemical Corp.; vice-chairman of the board, E. A. Geoghegan, vice-president, Southern Cotton Oil Co.; president, Russell Coleman; vice-president,

W. R. Allstetter, and secretary-treasurer, William S. Ritnour.

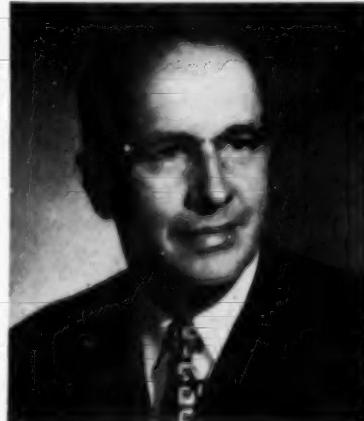
W. F. Price, Swift & Co., and Mrs. Louis Ware, head the hospitality committees for the convention.

Committees in charge of social and recreational activities and their chairmen include: Ladies' Bridge and Canasta Party, Mrs. J. A. Naftel, wife of the manager of the Plant Food Division, Pacific Coast Borax Co.; Men's Golf, John W. Hall, Potash Company of America; Ladies' Golf, Mrs. W. B. Porterfield, wife of the assistant sales manager of United States Potash Co.; Tennis, Joseph Mullen, Jr., Mathieson Chemical Corp.; Horseshoes, A. A. Schultz, Reading Bone Fertilizer Co.

**DR. RUSSELL COLEMAN**  
President, National Fertilizer Ass'n.



**E. TAFT BENSON**  
Secretary of Agriculture



**W. STERLING COLE**  
New York Congressman



## *Yesterday Today and Tomorrow*

**Firman E. Bear**



**S**EVENTY years ago this May I was born on a farm near Dayton, Ohio. I feel very grateful to Providence for having arranged for me to be born and raised on a farm. For there is nothing that quite takes the place in a child's life of being permitted to grow up with the calves, colts, pigs, and baby chicks and with all the other animal and plant life, both wild and domestic, that abounds on the farm. There is a great deal more meaning to winter, spring, summer, and autumn in the country than there is in town. And even the smallest child has useful work to do in taking care of his own particular interests—the rabbits, birds, kittens, and pups that arrive each spring. Then there is always a creek running through the farm that is filled with delightful little tadpoles and turtles and offers promise of fish.

There is so much of this wonderful country in which to be born and in which to live that some  $2\frac{1}{2}$  million more people are moving in with us every year. And although it takes about 1 ton of food annually for each extra person who sits down to the table with us, we always have plenty, and to spare. In fact, one of our most troublesome problems at the moment is that of getting rid of our surplus of agricultural production.

Twenty five years ago our demographers had reached the conclusion that the population of this country would probably come to an equilibrium at around 175 million about 1975. But, for some unexplained reason, the curve of population growth has changed its direction. Unless something interferes, it now appears that we may have 200 million people by 1975 and possibly over 250 million by the year 2,000.

There are a lot of people who are convinced of the certainty of the Malthusian principle that population can be

(Turn to Page 121)

### **Dr. Firman Bear Retires**

Dr. Firman E. Bear, professor of agricultural chemistry and chairman of the Soils Department at the New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick, N. J., since 1940, will retire on June 30th. Dr. Bear will continue as editor-in-chief of *Soil Science* and will maintain an office on the campus. Immediately following his retirement, Dr. Bear will spend some time in South America, visiting Peru, Chile, Argentina, and Brazil.

Dr. Bear received degrees of bachelor of science and master of science at Ohio State University, where he specialized in agricultural and general chemistry. The University of Wisconsin later awarded him a doctor of philosophy degree after he completed investigations in bacteriology, biological chemistry and soils.

Dr. Bear was instructor in soils at Ohio State University from 1908 to 1910. After an interval spent in graduate work at the University of Wisconsin and as head of the soils department at the University of West Virginia, he returned to Ohio State as head of the Department of Soils, which position he held from 1916 to 1929.

From 1929 to 1938, as director of agricultural research for the American Cyanamid Company, Dr. Bear traveled throughout the United States, over much of Europe, and in Canada, Mexico, and Central America. Later as a graduate student, he spent a year in France, partly at L'Institute Agronomique, Paris, and still later an additional year was spent in industrial research with the Stickstoff Syndicate, Berlin. He was a delegate to the International Nitrogen Conference on the Adriatic Sea.

Dr. Bear has been in constant demand as a speaker at meetings of scientific and business organizations throughout the United States. He is past president and fellow of the American Society of Agronomy, past president of the Soil Science Society

(Turn to Page 121)

# American Plant

## Food Council



PAUL T. TRUITT  
Plant Food Council President



E. LIPSCOMB  
National Cotton Council

PAUL D. SANDERS  
Editor of "Southern Planter"



MAY, 1954

***to discuss agricultural problems, public relations, farm economics—at ninth convention, June 10-13.***

**E**ZRA Taft Benson, secretary of agriculture, will address the ninth annual convention of the American Plant Food Council, to be held June 10-13 at The Homestead, Hot Springs, Va. Reports from authorities on farm equipment, fertilizer, agricultural economics, etc., are also featured in this year's program.

The convention will begin on Friday, June 11, with the annual address of the council's president, Paul Truitt. He will be followed by four speakers on a panel program devoted to agricultural public relations, with Robert H. Reed, editor *Country Gentleman*, and president of the American Agricultural Editors' Association, as moderator. Other speakers on the panel will include: Stanley Andrews, managing director, national project in agricultural communications, Michigan State College; and Ed Lipscomb, director of public relations, National Cotton Council of America.

Speakers on Saturday, June 12, will be: Rep. Charles B. Hoeven (R-Iowa) chairman, House Agriculture Subcommittee on Fertilizer and Farm Machinery; Secretary of Agriculture Ezra Taft Benson; and Dr. Earl O. Heady, professor of agricultural economics, agricultural economics and rural sociology department,

Iowa State College at Ames, Iowa. The Council's annual business meeting will follow with reports from the credential and nominating committees, followed by the election of eight new members to the board of directors.

An after-dinner reception, sponsored by the Southwest Potash Corporation, on Friday evening and a Hospitality Hour, courtesy of the Potash Company of America, on Saturday evening, will be features of the convention.

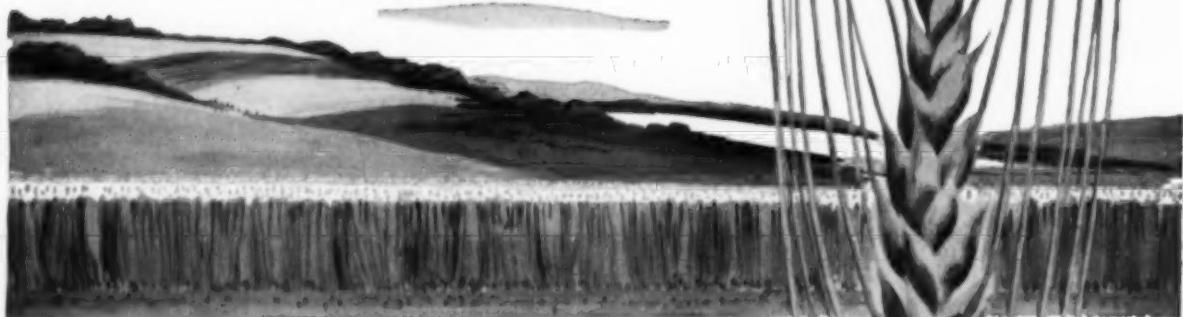
More than 550 of the nation's leading manufacturers of fertilizer and producers of fertilizer materials, together with leaders in the field of agricultural education and research, are expected at the 1954 conference.

The council's board of directors will hold its sessions on June 10, prior to the opening of the convention. W. T. Wright, Norfolk, Va., is chairman of the convention committee. Other members include: Horace M. Albright, New York City; W. B. Copeland, Norfolk, Va.; Edwin Pate, Laurinburg, N. C.; P. J. Prosser, Baltimore, Md.; and James F. Doetsch, New York City (ex officio).

Other committee chairmen are: Nominating, Raymond R. Hull, Camden, N. J.; Memorial, M. S. Wright,

(Continued on Page 110)

Weed-free wheat with  
**DIAMOND**  
**2,4-D**  
**WEED KILLERS**



DIAMOND 2,4-D kills weeds right down to their root systems—and has little or no effect on most beneficial grasses. When used on weeds that choke off wheat and other cereal crops, bigger and better yields result.

Easy to apply, DIAMOND 2,4-D mixes readily in hard or soft water.

DIAMOND offers formulators a complete line—Amine Salts, Butyl and Isopropyl Esters of 2,4-D—as well as low volatile esters in many technical forms. Write for new catalog describing properties and applications.

For best results, think first of DIAMOND—one of the world's largest manufacturers of herbicides and insecticides.

**Diamond Agricultural Chemicals**

WEED & BRUSH KILLERS	LINDANE	99% Gamma Isomer of BHC
2,4-D	BHC	14% Technical
and	BHC	36% Technical
2,4,5-T	K-101	Acaricide
	HEXACHLORO- BENZENE	Seed Disinfectant
DDT	100% Technical	

**DIAMOND ALKALI COMPANY**

Organic Chemicals Division  
Cleveland 14, Ohio

PLANTS: NEWARK, N. J. • HOUSTON, TEXAS



LIS ENING

*Post*

## Terramycin for Bacterial Spot; Bioquin 1 for Agr. Use

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

JOHN C. Dunegan, R. A. Wilson, and W. T. Morris, of the U. S. Department of Agriculture report that in 1952 experiments, the injection of 28.4 liters of a solution containing 1.7 grams of terramycin into an Elberta peach tree caused the leaves to develop a yellow green color. In addition, defoliation due to *Xanthomonas pruni*, the bacterial spot organism, was markedly reduced.

Because these results, observed following the treatment of only two trees, might well reflect individual tree variations, additional trees were treated in 1953. In the 1953 injection experiment three trees each of the varieties Sunhigh, Rio Oso Gem, and Valiant were treated at Beltsville, Maryland.

In making the injections, two  $\frac{1}{8}$ -inch holes were bored at right angles through the trunk of each tree approximately mid-way between the soil line and the crotch. After the debris was cleared from the holes, number "0" rubber stoppers, with  $\frac{1}{4}$ -inch glass tubes through their centers were inserted. The normal flare of the stopper insured a leakproof fit. The four tubes from each tree were connected to an elevated reservoir containing terramycin solution (100 ppm). Air was eliminated from the

system through the use of glass "T" connections as "bleeders."

The injections were started at 9 a.m. on April 23, 1953. It was planned to inject one tree of each variety with 2.4 grams of terramycin in 20 liters of water and a second tree with 4.8 grams of terramycin in 40 liters of water. The third tree was to receive 40 liters of water as a control. However, the uptake of the terramycin solution was very slow in comparison with the uptake of water in the control tree, and finally stopped before even 10 liters of terramycin solution were used. The first Sunhigh tree absorbed 7.5 liters containing 0.9 gram, and the second only 7.9 liters containing 0.95 gram, of terramycin. The control tree absorbed 40 liters of water. Similarly the Rio Oso Gem and Valiant trees absorbed 0.75, 0.94, 0.72, and 0.96 gram of terramycin, respectively.

After five days the leaves on all the trees that received terramycin developed a yellowish cast and could be distinguished readily from those on the control trees. This difference in color persisted for approximately 60 days.

In 1952 the trees had been injected in June and subsequently inoculated with *Xanthomonas pruni*.

Air was eliminated from the

In 1953 the injections were started at the beginning of the season and the trees were purposely not inoculated in order to determine whether the treatments affected the natural development of bacterial spot as the season advanced. The trees were examined from time to time during April and May and by June 1 it was evident that the disease was present to varying degrees on all.

The figures in Table 1, based on the examination of all the leaves dropping during the period June 10 to July 1, 1953, show that more leaves dropped from the control trees than from the trees injected with terramycin. Many of the leaves that dropped from the treated trees showed no bacterial spot symptoms, but the bacterial spot organism was responsible for most of the defoliation of the control trees, for 95, 88, and 73 percent, respectively, of the leaves showed typical bacterial spot symptoms. Moreover, the effects of the injection of terramycin were not limited to the leaves. When the fruit was examined at harvest it was found (Table 1) that there was less bacterial spot on the terramycin-treated trees.

It is well known that the incidence of bacterial spot on both leaves and fruit varies widely from tree to tree. The results of these small-scale experiments must, therefore, be accepted with caution, and should be confirmed by more extensive experiments before it can be stated that terramycin will control bacterial spot.

It is clear, however, from the yellow green color that developed in 1952 and 1953 on trees injected with terramycin solution that this material, or some degradation product from it, can be translocated throughout bearing peach trees.

Likewise the introduction of terramycin in some manner retards defoliation. This effect may be due solely to a reduction in the number of bacterial spot infections. On the other hand, it may be the result of some antidoting effect that prevents toxins produced by the organism from stimulating the formation of an absciss layer. These questions remain to be answered.

**T A B L E 1**  
Leaf drop and bacterial spot of terramycin-treated and untreated peach trees, 1953

Variety	Treatment	Leaves on ground—(June 10 to July 1, 1953)			Percent of fruit with bacterial spot
		Total Number	Number with bacterial spot	Percent with bacterial spot	
Sunhigh	Terramycin	2524	925	37	26
	Terramycin	1983	1376	69	35
	Control	8507	8124	95	85
Rio Oso Gem	Terramycin	573	176	31	22
	Terramycin	546	97	18	3
	Control	2699	2382	88	55
Valiant	Terramycin	788	78	10	2
	Terramycin	1010	125	12	0.5
	Control	2504	1828	73	11

**T A B L E 2**  
Control of blotch cankers on new twig growth of Duchess

Treatment/100 gal.	No. of cankers on 100 inches of new growth		
	Sprays applied	After 1947 season	After 1946 season
Ferbam, 1 lb.	Pink, calyx, 1st & 2nd cover	1	9
Bioquin, 1, 1/2 lb.	Pink, calyx, 1st & 2nd cover	0	18
Wettable sulfur, 8 lb.	Pink, calyx, 1st cover;		
Bordeaux, 4-6-100	2nd & 3rd covers	25	90
No treatment		29	110

**T A B L E 3**  
Control of blotch infection on Duchess fruit in commercial orchard tests.

Treatment/100 gal.*	Percent fruit infection at harvest			
	1946	1947	1948	1949
Ferbam, 1 lb.	2.0	3.0	.5	.1
Bioquin 1, 1 lb.	1.8	3.3	.4	.3
Bioquin 1, 1/2 lb.	4.0	5.6	.6	1.7
Bioquin 1, 1/4 lb.; Sulfur, 3 lb.	—	—	.9	1.8
No treatment	46.0	50.0	21.0	24.0

\*Sprays were applied in the pink, calyx, 1st, 2nd, and 3rd cover sprays.

**T A B L E 4**  
Comparative tests with Bioquin 1 in controlling apple scab over a four-year period.

Treatment/100 gal. <sup>†</sup>	Percent of fruit infection at harvest			
	1947	1948	1949	1950
Captan (50%), 2 lb.	—	—	—	5.2
Bioquin 1, 1/2 lb.	37.8	27.3	—	—
Bioquin 1, 1/4 lb.; Sulfur, 3 lbs.	—	16.4	2.8	10.1
Ferbam (76%), 1 1/2 lbs.	49.4	20.4	—	11.8
Crag 341, 1 qt.	47.6	51.0	2.6	9.0
Puratized Agricultural Spray, 1 pt.	28.2	14.3	4.1	8.3
Wettable sulfur, 8 lbs.	34.6	37.8	3.7	17.0
Unsprayed check	100.0	89.2	32.5	65.0

Finally the results of the two years' experiments show clearly that the effect of the terramycin persists throughout the season, for at the end of the season the treated trees still had many more leaves than the control tree.

(The terramycin used in the experiments in 1952 and 1953 was supplied gratuitously by the Chas. Pfizer Co., Brooklyn.)

#### An Evaluation of Copper 8-Quinolinolate As A Fungicide Against Some Apple and Pear Diseases

ACCORDING to Dwight Powell, of the University of Illinois, copper 8-quinolinolate (Bioquin 1) has long been recognized as a very effective organic fungicide, but its use has been restricted primarily to non-agricultural fields because of its excessive cost. Recent revival of interest in this chemical has led to further tests on its efficiency in controlling various plant diseases. Monsanto Chemical Company supplied materials and funds for this work.

In all field tests, spray applications were made with a conventional hydraulic sprayer using either single-nozzle guns or four-nozzle brooms. All sprays were in the dilute form and the recommended insecticides were mixed, when needed, into the fungicide treatments. To secure proper dispersion, Bioquin 1 (100% active) was mixed with a small amount of 70% alcohol before being added to the spray water.

*Apple Blotch (Phyllostica solitaria).* Bordeaux mixture starting at the second cover spray was the standard blotch treatment prior to the advent of the less phytotoxic organic fungicides such as ferbam. The organics, when used in the prebloom period, prevent primary infections of the current year's twig growth, thus reducing greatly the amount of inoculum in succeeding years. Table 2 gives the results of observations in 1946 and 1947 on trees sprayed during the preceding years.

It was evident that Bioquin 1 was extremely effective in reducing blotch lesions on the twigs, but was not superior to ferbam.

(Continued on Page 123)

## Early Activity of Boll Weevils. Cereal and Truck Crops Insects

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Economic Insect Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.

By Kelvin Dorward



ROUND trash examination in Georgia this spring to determine the survival rate of the boll weevil showed that there was an average of 467 live weevils per acre compared with 1,984 found in hibernation last fall. The average of 467 per acre for this season is well below the 1,055 found surviving the winter of 1952-53. This survey was conducted in Gordon, Spalding and Burke Counties. In Florence County, South Carolina, a total of 1,936 live boll weevils were found per acre in the spring of 1954 compared with 5,932 in 1953 and a 17-year average of 2,929. The per cent survival was 55 compared with 95 in 1953. Only in three other years on record has survival been lower. An average of 1820 live weevils was found in five representative cotton counties of North Carolina. This figure compares with 3920 per acre in 1953. Examination in two counties, Nansemond and Southampton, of Virginia showed an average of 1888 live weevils per acre. No spring examinations were made in this state in 1953; however, this year's average is over 4 times the average found in spring of 1952 in the same two counties. As previously reported, the survival rate for Madison Parish, Louisiana, this spring was 1,113 per acre or about one and one-half time the average found in this parish during the past 18 years.

### Cereal and Forage Insects

ONE of the most active of all the insects reported upon during April was the pea aphid. Reports received during the first part of the month recorded damage to newly-seeded alfalfa in the El Paso, Texas area and the insects were in outbreak numbers in areas of New Mexico.

By the middle of April the aphid was reported active from Delaware to Arizona. In Kansas, pea aphids were found in all fields surveyed with very serious infestations in parts of Montgomery and Wilson Counties. Increases were recorded in Oklahoma, Missouri, Illinois, Maryland and Delaware.

The meadow spittlebug was hatching by early April as far north as Illinois where nymphs were observed in Jasper, Champaign, White, Christian, Washington, Massac and Pulaski Counties. In Delaware by mid-April hatching was increasing and small spittle masses were appearing in alfalfa and clovers in the Smyrna-Leipsic area. Hatching in Maryland was observed on weeds, alfalfa and clover in Baltimore, Cecil, Somerset and Wicomico Counties.

The clover leaf weevil was another forage insect which was rather active during April. This insect caused damage to red clover in Delaware and Kansas. In Illinois, the weevils averaged 42 per square foot of clover in Champaign County, 14 in White, 55 in Christian, 26 in Jasper, 30 in Washington and 12 in Massac and Pulaski. Maryland reported one to four larvae per alfalfa plant while Missouri reported up to seven per crown in red clover, but fungus disease was evident on about 90 per cent of the larvae.

Mites on legumes were causing concern in several states. Infestations on clover were reported from Monticello, Hilliard and Starke, Florida. In Webster and Red River Parishes, Louisiana, the pest was causing considerable damage to clover. Damage was also occurring in small areas around Kirbyville, Lufkin and Bryan, Texas. Twenty per cent of the stand

was killed in one clover field in Shelby County, Missouri. In the Artesia, New Mexico area, considerable damage to new alfalfa was occurring in some fields.

Armyworms were continuing to attract attention in several states. Heavy flights were continuing in Louisiana and Mississippi and had occurred in Missouri. Moths were taken in Kentucky April 2 and as far north as Champaign, Illinois by April 6.

### Truck Crop Insects in April

DURING early April important insect activity was underway on truck crops in several Southern States. Mexican bean beetle adults and larvae were reported on beans in northern Florida and Charleston, South Carolina. Infestation of Colorado potato beetle was occurring on potatoes in these areas also, and on tomatoes in Tattnall County, Georgia. The heavy infestation of beet leafhopper on spinach in the Crystal City, Texas area was continuing and resulting in severe loss to the crop from curly top virus. Spider mites were well distributed on strawberries in Louisiana and eastern Virginia, and heavy enough in some fields in New Jersey to warrant use of miticides. Two important pests, hornworms and budworms, were appearing on tobacco in Florida. Medium to heavy infestations of cutworms were reported on vegetables, especially tomatoes, in Harris, Polk, St. Augustine and Cass Counties, Texas, while the corn earworm was heavy on lettuce in Zavala and Uvalde Counties. Potato psyllid populations in the breeding areas of the southwestern states were reported to be much higher during March 1954 than at any time in the past 10 years. If weather conditions are favorable during May and June, a potential danger exists for a northward movement into potato and tomato growing areas of Utah, Colorado, Wyoming, Montana and western Nebraska.

### Fruit Insect Activity

AMONG the more important fruit insect developments during the month was the appearance of (Continued on Page 115)



# *Announcing*

Pennsalt's NEW BHC PLANT

**Now in Full Commercial Production of Both  
High Gamma 46% Technical and Standard  
14% Technical**

You can now look to Pennsalt as an even better source for your BHC needs. From the new Calvert City, Kentucky plant, Pennsalt, the pioneer manufacturer of high gamma BHC, can supply you with 46% High Gamma Technical.

High Gamma content enables production of more highly concentrated dust bases, wettable powders or liquid formulations. Penco High Gamma BHC can be melted and impregnated for the production of quality cotton dusts; or

easily dissolved in common solvents to produce superior formulations at lower costs.

Penco BHC Technical containing 14% gamma is now also available from Pennsalt in flake form, for those who wish merely to grind and extend it into dust bases or finished cotton dusts.

For superior products of dependably high quality, backed by continuous research, choose the Penco Brand.

Write to the office nearest you for technical assistance, or ask for the new technical bulletin on Penco® BHC Products.

AGRICULTURAL CHEMICALS

**Pennsylvania Salt Manufacturing Company of Washington**

Tacoma 1, Washington • Philadelphia 7, Pennsylvania  
Montgomery, Alabama • Bryan, Texas • Portland, Oregon  
Los Angeles and Berkeley, California



## WASHINGTON

# Report

by

**Donald G. Lerch**

Cornwell, Inc., Washington, D. C.

(Agricultural Chemicals Washington Correspondent)

INDUSTRY leaders have been commended by Senator George Aiken (R. Vermont) for their progressive approach to the pending regulations concerning pesticides. His bill (S 2860) a companion to the Miller Bill (H.R. 7125), is receiving strong backing. Senator Aiken's own personal endorsement carries with it the prestige of his position as chairman of the Committee on Agriculture and Forestry. It is a strong reason for favorable action by the Labor and Public Welfare Committee to which it has been referred. Chairman of this committee is Alexander Smith of New Jersey.

As Senator Aiken sees it, "If the Congress enacts current legislation dealing with pesticide residues and regulations, the revised law will be of value to the consuming public, to American agriculture and to the industry that is developing and producing essential pesticides.

"While the pesticide industry has been active in endeavoring to insure that products placed on the market are not injurious to the public, it is significant that the leaders of this industry are those who have been energetic in seeking adequate safe guards through law," he continued. "Leading agricultural experts have joined in this call for revised legislation, for they rightly desire a simplified procedure for establishing tolerances, and the placing of responsibility for determining these highly technical questions in the

hands of scientists who can render a fair decision for all," Senator Aiken said.

\* \* \* \* \*

Somebody has been out there working! That's the way a lot of people view the big upsurge in fertilizer sales. There's confidence that total tonnage will be close to last year. What's more, sales of plant food may be higher!

If this becomes actuality, then it will be the "impossible" happening right in front of us. Some had said that the drop in sales last fall was so great it would be almost impossible to catch up. Consequently, the tonnage and plant food moved during the fertilizer year, both fall and spring, would be off considerably.

But the farmer is a born optimist. You can't really be a farmer unless you are. And farmers know fertilizer pays dividends—often the biggest. So, in spite of droughts, and falling prices, and in the face of acreage allotments and other restrictions, farmers are buying fertilizer. They are reported buying so much that some people are surprised.

\* \* \* \* \*

It may be a long way from Hollywood, but one field where superlatives seem in order is in chemical weed control. Some of the results farmers are getting would set an ad writer busy trying to find new words. From zero a few years ago to 30 million is a big jump in anything. In this case it refers to acres treated with herbicides. And as some see it,

30 million is just a good beginning.

Sure there are lots of problems. Some of the difficulties that have been confronting the herbicide manufacturers are enough to cause anyone to say "uncle." But, that's not the way U. S. business operates.

By sticking to it and working for improvements and refinements, chemical weed killing has not only come of age, it's in full flower. Figure that chemical weed control increases some yields as much as 30 percent. Not only that, herbicides reduce production costs, including labor.

Anyway you look at it, 1954 can be the biggest year ever for herbicides!

\* \* \* \* \*

Main target of the O'Hara bill is chemical additives in food. Pesticides as such apparently are not directly involved. This bill (H.R. 8418) introduced by Joseph O'Hara (R. Minnesota) is aimed at spelling out in more detail the provisions regarding chemicals added to food. However at several places in the bill specific mention is made that pesticides are excluded from consideration therein. In fact it is clearly stated that a chemical additive . . . does not include pesticide chemicals in or on raw agricultural commodities."

Consequently, it appears that the agricultural chemical industry can concentrate its attention on the provisions of the Miller Bill which will require considerable study and work to be integrated efficiently into the practical pattern of commercial use. It is not industry alone that will be concerned, but also farmers and growers, farm organizations, agricultural colleges, and numerous others who will be affected by the new regulations.

\* \* \* \* \*

Two panels scheduled for the National Fertilizer Association meeting at the Greenbrier, White Sulphur Springs, W. Va., June 14-16, are clues as to what's on management's mind. Dr. Russell Coleman, NFA president, expects real interest in the discussions of granulation and fertilizer distribution and use.

A good one word common denominator is—sales!

Granulation, referring primarily to physical condition of fertilizer, is becoming more of a talking point among buyers, according to reports. Ease of handling and performance in farm machinery are cited as factors that are increasing the popularity of granulated mixes.

Distribution and use of fertilizer run smack against the government allotment program which, while not intended to do so, is chipping away at the base of fertilizer demand. As some put it—what is done on the diverted acres can mean the difference between profit and loss for some fertilizer manufacturers. Since the problem of diverted acres appears here to stay—barring a big war—it is fast becoming one of the most important problems facing the industry. It is a symptom of our surplus age.

Certainly most industry men agree that supply of fertilizer has now more than met demand. The industry is to be congratulated for its tremendous expansion program which made possible this abundance of fertilizer. Industry is banking on an expanding agriculture and an expanding economy. Both appear on the horizon. The problem is how to get there right now.

One factor can give the industry much of which to be proud. This big sag in some farm prices has caused the farmer to use a different kind of a measuring stick for value. Because he has to face hard economic reality, the farmer has been quick to cut off all but the best values he can find.

Right now it looks as though the fertilizer industry is being given a rousing vote of confidence. The farmer is in effect saying—fertilizer is one of the best buys he can make.

\* \* \* \* \*

Many wheat farmers have been worried about sub soil moisture. It will take lots of rain over a period of months to get us back to where we feel safe. Moisture can well be a factor seriously limiting production this year. While surpluses would hide any general crop losses, the real

"hurt" would come from reduced yields. Use of the best seed, lots of fertilizer, chemical control of insects and weeds costs money. The farmer can lose much of his investment in these production aids if he doesn't have moisture.

This is one of the reasons why agricultural chemicals have to be "sold" again and again—season after season. Chemicals can help crops overcome moisture deficiency up to a point. Then water is the limiting factor. That's why it might be well to keep a close eye on farm use as it relates to weather—both long range forecasts and the weather of last year.

\* \* \*

It remains highly problematical how much of a market fertilizer manufacturers can expect from government buying. Discussion between industry and government representatives thus far has only indicated many reasons why the government can not do much about it. It is still possible however, that something can be done. The question is, what does it take to jar it loose? And, is it worth it?

In an ideal situation, the domestic fertilizer industry would bid successfully for the export market and fill the orders during "off season." This would even out the labor market and provide outlets for the abundant production. However, this blissful state seems likely to remain mostly a mirage. For one thing FOA is required to consider the low bidder first, even though it comes from an off shore source. Furthermore, the provision requiring the industry to use U. S. ship bottoms often serves to nullify a bid because of the lower rates of foreign shipping which off shore sources figure on in bidding.

It seems likely that FOA will strive to do all it can to favor U. S. suppliers, but the acts just mentioned plus barter deals, currency fluctuations and general world unrest make it a hard problem.

\* \* \* \* \*

After several strenuous sessions between government and industry, the new nitrogen tonnage established as eligible for certificates of necessity

is 163,000 tons of N. This is considerably lower than some government officials had previously said they felt was needed.

The statement revealing such a goal also stated that enough applications for certificates were then on hand, representing enough potential production, to more than meet the goal. Like all others, the nitrogen expansion goal was set in terms of rated capacity according to officials of the Office of Defense Mobilization.

There are 190,000 tons of N production for which certificates have been issued, but plant construction apparently has not yet been started. It seems likely that if any of these certificates are "turned back" to the government, other companies might be eligible for consideration.

\* \* \* \* \*

#### **Soil Conditioner Hearing**

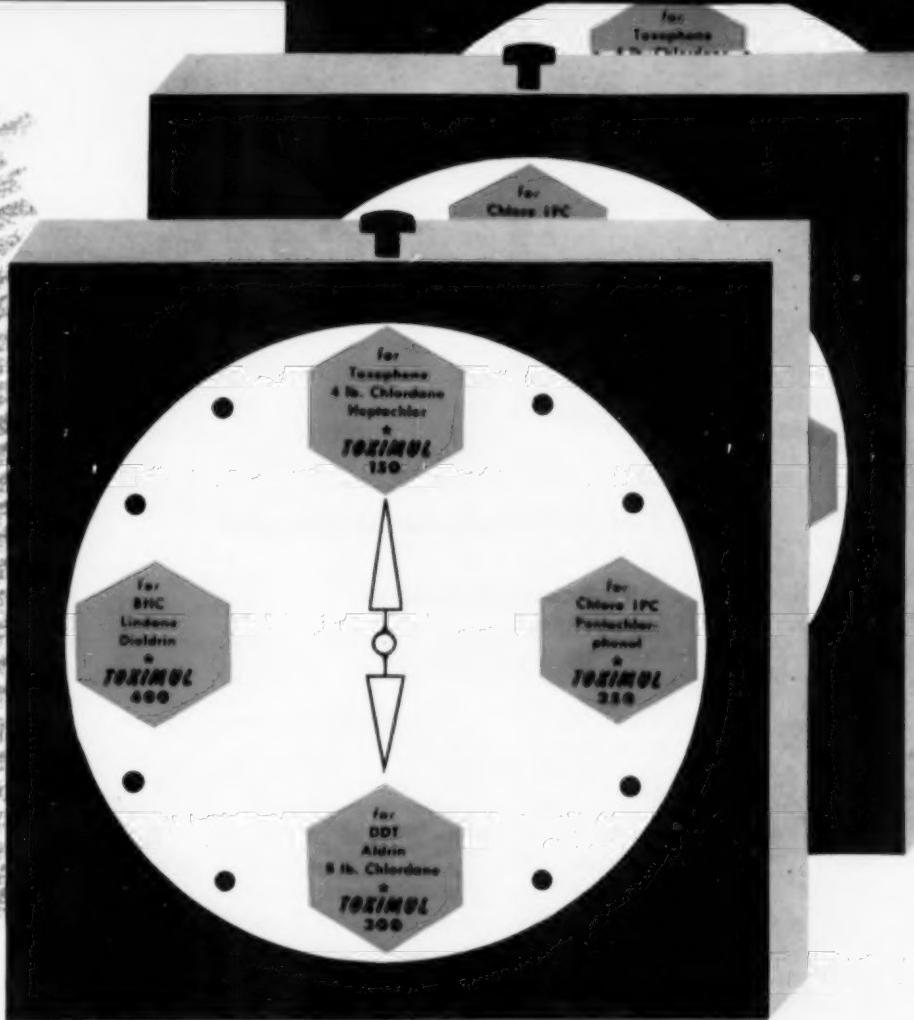
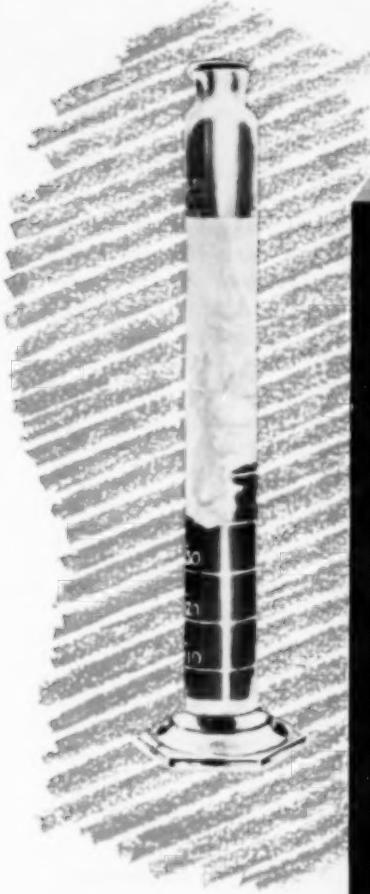
A final public hearing for proposed rules of fair trade practices for the chemical soil conditioner industry was held in the U. S. Court House, New York, April 23, and sponsored by the Federal Trade Commission. It was a followup to a preliminary meeting last December at which the first draft of the soil conditioner rules was drawn up.

Only minor changes in wording of two main rules affecting the industry were suggested. If approved by the Commission, attorney Stauffer stated, the rules would next be printed in the *Federal Register*.

Among the companies represented at the hearing were Loamium Co. of America, Monsanto Chemical Company, Nitrogen Division, Allied Chemical & Dye Corp., American Agricultural Chemical Co. and B. F. Goodrich Chemical Co.

Under the rules, advertisers will be cautioned against claims that conditioners will help all soils under all conditions, that they are substitutes for nutrient material, that they are complete substitutes for organic matter and that their effects are permanent.

Other portions of the rules refer to depth of treatment at which conditioners must be applied, and the results which it is possible to obtain.

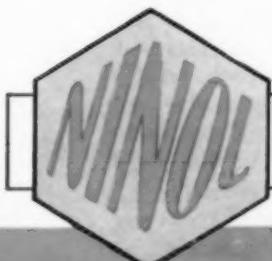


for  
**BETTER**  
**FORMULATIONS**  
it's always

## Time for TOXIMUL!

There's no time like the present to take advantage of the TOXIMULS, if you want formulations of the highest quality at the lowest cost! These Ninol-developed anionic-nonionic blends give you new highs in *flash dispersibility* and *emulsion stability* in all waters.

It will pay you to investigate the TOXIMUL Blended Emulsifiers — there's one especially suited to *your* formulation, unless you have a very unusual problem. And if you do, we will be happy to develop a special TOXIMUL to fit it. Write today for samples and bulletins.



Detergents —  
Emulsifiers

For plants all over the country, these features of the versatile and efficient TOXIMULS have meant better production, more satisfied users of their products — yet with an actual saving on costs!

### SEND THIS COUPON NOW!

**NINOL LABORATORIES, INC., DEPT. A,**  
1719 S. CLINTON ST., CHICAGO 16, ILL.

Gentlemen:

Please send working samples and Technical Bulletins describing:

- TOXIMUL 150 (for use with Toxaphene, 4 lb. Chlordane, Heptachlor)
- TOXIMUL 250 (for use with Chlore IPC, Pentachlorophenol)
- TOXIMUL 300 (for use with DDT, Aldrin, 8 lb. Chlordane)
- TOXIMUL 400 (for use with BHC, Lindane, Dieldrin)
- TOXIMULS (for use with other pesticides)

Signed \_\_\_\_\_

Co. \_\_\_\_\_

Street \_\_\_\_\_

City & State \_\_\_\_\_

# NINOL LABORATORIES, INC.

1719 S. CLINTON • CHICAGO 16 • PHONE CHESAPEAKE 3-9625

In Canada: Chemical Developments of Canada Ltd., 420 Lagauchetiere Street W., Montreal 1, Quebec

## Technical

### SECTION

#### *Non-Selective Petroleum Herbicides*

By Arthur H. Bronsen

Richfield Oil Corporation of California  
Los Angeles, California

**I**N California and Arizona the use of non-selective petroleum herbicides, sold by brand name and registered under economic poisons regulations, has been greatly on the increase. Losing ground, literally and figuratively, have been the low cost "sour" diesel oils, other distillates, and waste oils. While costing less per gallon than the oil sold as branded economic poisons, these seemingly cheaper oils have been proved many times to be more expensive, because of their relatively low phytotoxicity.

Many have asked, "Is there a yardstick for the relative effectiveness of non-selective weed oils? Is it possible to write a specification for a good weed oil?" These are questions that we have attempted to answer. From field observation of applications of non-selective weed oils, with subsequent chromatographic analyses of the oils, it was found that those of greatest value had as a common characteristic, a high percentage of polycyclic aromatics.

To test the validity of these observations, H. Fred Arle of the U.S.D.A., Division of Weed Investigations, initiated a field test program on Johnson Grass. In these tests, the total per cent aromatics was kept constant in the test oils, but the relationship of the single ring aromatics (monocyclics; related to benzene) to the two and three ring aromatics (polycyclics; related to naphthalene

and anthracene) was varied. It was definitely established by this work that as the polycyclic aromatics increased, greater control was achieved with fewer gallons per acre.

In the work done by Havis at Cornell in 1950, the toxicity of pure hydrocarbons was investigated. Of the unsaturates studied, only the aromatics showed high toxicity, with the polycyclics having the greatest toxicity. Olefins did not exhibit significant toxicity. Of the saturates, the cycloparaffins were more toxic than the straight chain paraffins; but both were minor factors in herbicidal activity.

Whitworth in 1953 at New Mexico A & M further demonstrated that with increased polycyclic aromatic content of the weed oils tested, greater control of Johnson grass was achieved.

In view of the low order of toxicity of olefins, a statement of per cent unsaturates, which includes both olefins and aromatics, can be misleading, if used as a measure of toxicity. In 1952, Crafts at Davis, in a publication entitled "Herbicidal Uses of Oils," wrote "Recently it has been noted that certain polycyclic aromatic compounds cause marked chronic toxicity, particularly on large grass plants." The question can be answered. The polycyclic aromatic content of a non-selective weed oil is the best known yardstick for effectiveness.

Polycyclic aromatics are not present in oil fractions boiling under 400°F and are not present in high concentration in oils having an A.P.I. gravity greater than 20. Wetting of the foliage and formation of quick-breaking water emulsions are also necessary considerations in evaluation of weed oils. Interfacial tension has been found to be a good measure of this characteristic. A suggested specification for bid or other use is as follows:

##### **Non-Selective Herbicidal Oil**

A.P.I. Gravity	Max. 20
Initial Boiling Point	Min. 400 Deg. F.
End Point	Min. 700 Deg. F.
Aromatics	Min. 65%

Interfacial Tension Min. 5 dynes/cm.

Through modern refining technique and specification control, the petroleum industry over recent years has been able to deliver products which offer more killing power per gallon of non-selective weed oil with resultant greater effectiveness and economy.★★

##### **USDA Warns '54 Pest Increase**

The European corn borer is now better established and potentially more of a threat to corn production than a year ago, the U. S. Department of Agriculture reported recently. Surveys carried out last fall, principally by State entomologists cooperating with the Agricultural Research Service, showed this pest to have infested one new State—Wyoming—and 48 new counties in 9 previously infested States. Infested counties now total 1,557 in 38 States.

The U.S.D.A. reports also that Grasshoppers, Mormon crickets, and chinch bugs are three of this country's major agricultural insect pests that could be more than normally troublesome to farmers and ranchers in some areas this year. Infestation surveys conducted last fall by entomologists of State Agencies and the Agricultural Research Service, indicate that, barring weather and other natural conditions that might affect their populations, these three insects will need to be controlled over wide areas to prevent excessive damage to crops and ranges.

### Birch Leaf Miner Control

The first brood of birch leaf miners may be controlled by spraying infested foliage with a 57 per cent malathion or 25 per cent lindane emulsion at the rate of  $\frac{1}{2}$  to 1 pint in 100 gallons of water ( $\frac{1}{2}$  to 1 teaspoon per gallon). Wettable powders may be substituted for the emulsions at the rate of 1 to 2 pounds per 100 gallons of water (1 to teaspoons per gallon). Treatment should be made between May 12 and 17 in most years; the general rule is whenever birch leaves are fairly well developed. This will vary with seasonal differences. Therefore, critical timing is essential to good control. Leaves found to contain small, grayish or blanched, kidney-shaped areas when held up to the light are ready for spraying. One treatment at this time in May should adequately control the first brood of miners.

A treatment to control the second brood of birch leaf miners effectively should be made during

the last few days of June through the first several days of July. Here again, however, the occurrence of the second brood depends in large measure on the development of the first brood and on weather conditions. Under many conditions, a second treatment for the second brood may not be needed. However, if required, it should follow the first in 10 to 14 days. Malathion or lindane used as outlined above for control of the first brood of miners in May and properly timed in late June and July, will prevent noticeable injury to early and midsummer birch foliage by the second brood.

Chlordane has been used successfully for control of birch leaf

miner. It has been stated, however, that chlordane has caused some dropping of foliage when applied to the red or river birch (*Betula nigra*). Hence, caution should be exercised in the use of chlordane on *B. nigra*.

Circular #185, by John C. Schread, Conn. Agric. Exp. Sta., Jan. 1954.

### N-244 Controls Rice White Tip

Treatment of rice seed at planting time by N-244 will keep rice fields free of the destructive white tip disease, Dr. E. M. Cralley of the Arkansas Agricultural Experiment Station has announced. This method has produced about 99 per cent control of the disease since experiments began with the new commercial chemical, now on the market for general use.

Dr. Cralley estimates that average yield increase obtainable through control of white tip would be about 10 bushels to the acre, although increases as high as 28 bushels to the acre have been obtained through treatment with N-244.

**At the joint meeting of the mid-western agronomists and fertilizer industry representatives held recently in Chicago ("Agricultural Chemicals" p. 95, March, 1954), A. J. Ohlrogge, Purdue University, presented the following agronomists' list of recommended fertilizer grades and ratios for 1954.**

#### State Agronomists' Suggested Minimum Fertilizer Grade Needs of the Middle West for the Year Beginning July 1, 1954\*

Straight materials supplying nitrogen, phosphate and potash are also needed. Minor and secondary elements as materials and in mixed fertilizers are required in localized areas.

Ratio	Ill.	Ind.	Iowa	Kan.	Ky.	Mich.	Minn.	Mo.	Nebr.	N. Dak.	Ohio	S. Dak.	Wisc.
0:1:3	0-10-30	0-10-30	0-10-30			0-9-27	0-9-27	0-10-30			0-10-30		0-10-30
0:1:2	0-10-20	0-10-20				0-10-20	0-10-20	0-10-20			0-10-20		
0:1:1	0-20-20	0-16-16	0-20-20	0-20-20	0-12-12	0-20-20	0-20-20	0-20-20			0-14-14		0-20-20
0:2:1	0-20-10	0-20-10	0-20-10			0-16-8	0-20-10	0-20-10			0-20-10	0-20-10	0-20-10
1:6:3						3-18-9		4-24-12		4-24-12		4-24-12	
1:4:4	4-16-16	4-16-16	4-16-16			3-12-12	3-12-12	4-16-16	4-16-16		3-12-12		4-16-16
1:4:2	5-20-10	4-16-8	5-20-10				4-16-8	5-20-10		5-20-10	4-16-8		
1:4:1						5-20-5							
1:3:9	3-9-27					3-9-27		3-9-27				3-9-27	
1:3:6	3-9-19	3-9-18				3-9-18	3-9-18				3-9-18	3-9-18	
1:3:2						4-12-8							
1:3:1						8-24-8		8-24-8	8-24-8				
1:2:3							5-10-15				5-10-15		
1:2:2		8-16-16	6-12-12				5-10-10		8-16-16	6-12-12		6-12-12	
1:2:1				10-20-10	10-20-10				10-20-10	12-24-12	10-20-10	10-20-10	10-20-10
1:1:3						6-6-18						6-6-18	
1:1:1	10-10-10	10-10-10	10-10-10	10-10-10	8-8-8	10-10-10	10-10-10	10-10-10		10-10-10	10-10-10		10-10-10
1:4:0		6-24-0	6-24-0	8-32-0			8-32-0		8-32-0	8-32-0		8-32-0	
1:3:0			10-30-0	10-30-0				13-39-0	13-39-0	10-30-0		13-39-0	
1:2:0			10-20-0	10-20-0				10-20-0	10-20-0	10-20-0	10-20-0		10-20-0
1:1:0			15-15-0	15-15-0					15-15-0	15-15-0		15-15-0	
2:1:1		14-7-7				14-7-7					14-7-7		
2:2:1										12-12-6			

\*The production of higher grades of the suggested ratios is encouraged.  
A regional minimum concentration of 27 units is suggested excepting Kentucky which suggests a 24 unit minimum.

# MATHIESON

## top-quality AGRICULTURAL CHEMICALS



## SUPERPHOSPHATE



## SULPHATE OF AMMONIA



## NITRATE OF SODA

for complete information write:



MATHIESON CHEMICAL CORPORATION

Mathieson Agricultural Chemicals Division  
Little Rock, Arkansas



### Fungicides for Rust Analysis

Studies at the North Dakota Experimental Station on the use of sulfur for rust control have indicated that the yield of wheat could be increased at least three to four bushels per acre, and that the quality and bushel weight of the grain could be increased. However, even these increases would scarcely pay the cost of the required applications.

Additional studies on rust control have yielded the following conclusions:

1. Liquid Parzate and Dithane sprays, with zinc sulphate added at the field, are not expensive fungicides, costing about \$7.50 for three applications. In years having severe rust outbreaks, such as 1953, spraying might be advisable.

2. Calcium sulfamate spray used at the rate of 15 pounds per acre, dissolved in 12 gallons or more of water would cost about \$6.50 per acre, for one application. A single application increased the yield of wheat by four or five bushels per acre and raised the bushel weight a few pounds in 1953. However, this treatment as used, caused significant damage to the germination of the harvested grain.

3. These newer fungicides are marked improvements over the sulphur dust but yet leave much to be desired.

4. There are grounds for hope that a more satisfactory fungicide than any used in these tests may be developed. Right now it appears that much more research and testing will be required.

A preliminary report by W. E. Brentzel, pp 102-110, Vol. 16, No. 3, Bimonthly Bulletin, North Dakota Agricultural Exp. Sta., Fargo, North Dakota.

### Wasps for Bollworm Control

Experiments to find a natural enemy of the pink bollworm are underway at an Agriculture Department laboratory in Moorestown, N. J. Wasps imported from India are under investigation, to see if they can survive the cotton states' winter and reduce bollworm damage under field conditions in this country. In India,

the wasps lay their eggs on the bollworm or its eggs. As the larva grows, it destroys its host.

### Mexican Bean Beetle Control

Recent research, in cooperation with the Virginia and North Carolina Agricultural Experiment Stations, has proved the effectiveness of the insecticides CS-708, malathion, and parathion for controlling the Mexican bean beetle, an insect that annually devours an estimated \$5,000,000 worth of U. S. edible bean crops.

CS-708, malathion, and parathion in either spray or dust form are being recommended this year for the first time for use against the bean beetle by entomologists of the U. S. Department of Agriculture. How to apply these chemicals and the other chemicals in current use, rotenone and methoxychlor, is described in detail in a revised Department publication, "The Mexican Bean Beetle in the East and Its Control."

Unlike rotenone and methoxychlor, which present no residual hazard, the newly-recommended chemicals must be applied early enough to avoid leaving residues on harvested crops. Entomologists caution that malathion must not be applied to beans within 14 days of harvest; parathion must not be applied within 21 days of harvest for snap beans, or 15 days for lima and dry beans; and CS-708 should not be applied to snap beans after the pods begin to form or used on vines that are to be fed to milk animals or to meat animals being finished for slaughter.

### Disease Resistant Tree Studies

Research projects in progress at the Connecticut Agricultural Experiment Station on breeding disease-resistant varieties of trees for timber have resulted in one new development at this time, that disease resistance is apparently correlated with the kind and amount of soluble tannin in the bark. It is reported that if the tannins causing disease resistance can be determined when the trees are very young, and before they become infected, this may aid in speeding up the breeding program.

### Red Harvester Ant Studies

The red harvester ant, an insect that by its foraging takes thousands of acres out of agricultural production in the Southwest, can be effectively controlled with either insecticidal dusts or fumigants, report entomologists of the U. S. Department of Agriculture. Proper use of dieldrin or chlordane insecticides, or carbon disulfide or methyl bromide fumigants is described in a new U. S. Department of Agriculture publication, Farmers' Bulletin 1668.

Insecticidal dust control is accomplished by spreading about a half-pound of 2% per cent dieldrin or 5% per cent chlordane in a 4-to 6-inch band that circles the nest entrance hole (usually in the middle of the barren area) at a radius of 2½ to 3 feet.

Foraging ants which attempt to cross the band pick up lethal amounts of the chemical on their bodies and some will carry the material back into the nest where it will kill the egg-laying queen ant. Active colonies can be wiped out by keeping the dust barrier intact and by renewing it at intervals of every few weeks or at any sign of ant life.

Small colonies that have cleared an area of more than 4 feet in diameter can be controlled by pouring 4 ounces of carbon disulfide into the entrance hole to the nest, and then blocking the entrance by stamping dirt into it. To fumigate bigger nests it is necessary to remove a 6-inch layer of soil for a diameter of 3 to 6 feet around the nest entrance. This exposes the vertical tunnels, down which the fumigant can be poured. The tunnels are then sealed with dirt.

Methyl bromide provides good kills in moist soil, but it must be applied with a mechanical dispenser that will release the lethal gas in the entrance tunnel 6 to 8 inches below ground level.

Southwestern farmers and ranchers troubled with this ant will find complete information about it and its control in Farmers' Bulletin 1668. A single copy may be obtained from the Office of Information, U. S. D. A., Washington 25, D. C.

# TRONABOR®

A NEW CONCENTRATED BORATE WEED KILLER



## TRONABOR

is a new concentrated borate weed killer containing not less than 13.7% Boron and 44% B<sub>2</sub>O<sub>3</sub>, combining the properties of a general-contact weed killer and soil sterilant. TRONABOR is most effective when applied dry but can also be used in solution as a spray. When you use TRONABOR the job is done! Most weed growth is destroyed for a year or longer. Under favorable conditions TRONABOR may give control up to three or four years. When applied before or during seasonal rainfall it is dissolved and permeates the soil to the root zone of the plants where it destroys and prevents re-growth until removed by normal leaching. TRONABOR is safe, easy to apply, non-corrosive and non-flammable. No other type of weed killer combines so many advantages.

### HOW AND WHEN TO APPLY TRONABOR

In dry form, TRONABOR is easily applied by hand-broadcasting. On larger areas one of several available types of fertilizer or lime-spreaders is recommended. It should be distributed evenly and in sufficient amount. It is better to over- than under-apply, since too little may give unsatisfactory results. Where practical, standing weed growth should be cut to a height of 4 to 6 inches to insure that the TRONABOR is spread evenly. On bare slopes raking in will prevent the material from washing away during heavy rains.

\*\*\*\*\*  
TRONABOR is best applied in the Fall, Winter or early Spring when rainfall

carries it into the root area of the soil. TRONABOR must be dissolved to be effective. For annuals and shallow-rooted perennials apply when plants are young and tender. Deep-rooted perennials should be treated in Fall or Winter. Apply TRONABOR at the rate of 7½ to 11 pounds per 100 square feet, depending upon severity of conditions. The higher application should be used on steep slopes, where weed growth is thickly matted or well established, or where the soil is hard and impervious or very sandy or porous. Spot retreatment of some areas at about ½ the above dosages may be advisable later.

\*Trade Mark Registered



BORAX • POTASH • SODA ASH • SALT CAKE • LITHIUM & BROMINE CHEMICALS  
and a diversified line of specialized AGRICULTURAL, REFRIGERANT and INDUSTRIAL CHEMICALS

Offices: 3030 West Sixth Street, Los Angeles 54, California  
122 East 42nd Street, New York 17, N. Y.

• ESTON CHEMICALS DIVISION  
3100 East 26th Street, Los Angeles 23, California

Plant: Trona and Los Angeles, California

### American Potash & Chemical Corporation

### TRONABOR KILLS..

Russian Knapweed  
Canada Thistle  
Bindweed  
Toad Flax  
Leafy Spurge  
Whitetop (Hoary Cress)  
Johnson Grass  
Poison Ivy and Oak  
St. Johnswort  
(Klamath Weed)  
And many others.

### Sprays Affect Apple Quality

Recent research work directed by Dr. Philip Garman, entomologist at the Connecticut Agricultural Experiment Station, shows that there is a relationship between various chemical sprays and the amount of sugar and acid in an apple, factors which have a pronounced effect on flavor. Some sprays actually increase the quantity of sugars and acids in fruit; others have a depressant effect and lower the amounts.

Some 20 insecticides and fungicides, in various combinations, were used in the Connecticut experiments. It was found that, in general, sprays containing the insecticide, arsenate of lead, decreased both sugars and acids to some extent. Some fungicides, on the other hand, notably "Crag 341," increased the sugar content of the fruit. Fungicides also had an effect upon acid; some combinations reduced acids, while others such as captan or "Crag 341" (with lead arsenate) did not have this effect; in fact, a slight increase was noted for captan.

### Gypsy Moth Control

The development of DDT to control gypsy moth, and of aircraft for spraying has provided economical control measures. When the caterpillars first start to feed, one-half pound of DDT per acre usually kills all of them. After they are partly grown and the trees are partially defoliated, one pound per acre is required. Airplanes using oil solutions or emulsions can apply the material at a cost usually less than \$1.50 an acre for large areas. Since heavy infestations of this pest seldom occur over small areas, it is usually possible for owners of small woodlots in the same neighborhood to cooperate in spraying contracts and get the benefit of the price for large areas.

Small areas can also be sprayed by a mist blower from the ground. There should be roadways open at intervals of about 100 feet to allow thorough treatment. The cost per acre of treatment from the ground is considerably higher than from the air.

Isolated heavily infested trees and the woodland surrounding dwelling houses can be sprayed with a mist blower. In the case of houses, the operator may drive around the open area, directing the spray into the trees. This should kill enough of the larvae to prevent migration over the lawn and building.

Avoiding contamination of pastures adjoining woodlands is a problem. Trained pilots can usually treat woodlands without depositing large quantities of spray on pastures. Small woodlots surrounded by pastures can be sprayed with methoxychlor instead of DDT. Methoxychlor is supposedly not secreted in milk from cows feeding on treated forage. N. Turner and O. B. Cooke, Circular 186, Connecticut Exp. Sta.

It." This 8-page publication has been prepared by the Agricultural Research Service.

### Literature Available

The following list reviews a series of bulletins on fertilizer, insecticide and fungicide recommendations, controls, etc. For the most part, these bulletins and reports are prepared by the various state agricultural experiment stations, and copies may be obtained by writing directly to the respective stations.

FERTILIZER AND LIME RECOMMENDATIONS FOR NEW JERSEY. 16 pp. Bulletin 552. New Jersey Agric. Exp. Sta., New Brunswick, N. J.

DROSOPHILA AS A PEST OF PROCESSING TOMATOES by B. B. Pepper, J. P. Reed and O. Starner, 8 pages. Factors influencing activity, control measures, field control, control at the processing plant, insecticides. Bulletin 266. New Jersey Agric. Exp. Sta., New Brunswick, N. J.

WARREN COUNTY SOILS by J. C. F. Tedrow. 42 pp. Their nature, conservation and use; agriculture; soil classification; adapting crops to soils. Bulletin 773. New Jersey Agric. Exp. Sta., New Brunswick, N. J.

ZEIN, A BIBLIOGRAPHY by D. M. Rathmann. A bibliography of 942 citations, including U. S. and foreign patents. Available on request from the Mellon Institute, 4400 Fifth Avenue, Pittsburgh.

QUALITY OF APPLES AS AFFECTED BY SPRAYS by P. Garma, L. G. Keirstead, and W. T. Mathis. 46 pp. Effect of sprays on chemical composition, on physical appearance and yield, on flavor and quality. Bull. 576. Conn. Agri. Exp. Sta.

A ROLLING COULTER FURROW OPENER FOR DEEP PLACEMENT OF FERTILIZER. Newly developed equipment places one band of fertilizer near the seed and a second band at a greater depth, increasing corn yields. Bull. 36: 42 Michigan State College, Exp. Sta.

PEPPERMINT INSECT CONTROL by E. C. Klostermeyer. Outline of type insects attacking peppermint, and suggests control measures. U.S.D.A., Pullman Wash., Ext. Mimeo. 1620

CONTROL OF THE TIMOTHY MITE ON GRASS SEED CROPS by E. C. Klostermeyer and D. R. Malcolm. USDA, Pullman, Wash. Ext. Mimeo. 1619.

MALAPHOS. Leaflet describing the properties and usages of the organic phosphate insecticide. It is recommended for use on such crops as apples, pears, tomatoes, beans, peas and ornamentals, against such pests as spider mites, aphids, leafhoppers, mealybugs, and soft brown scale. Ester Chemicals Division, Los Angeles.

### New Nematode Species

The tobacco cyst nematode, first discovered in Connecticut in 1951 by Dr. B. F. Lounsbury, formerly plant pathologist at the Connecticut Agricultural Experiment Station, is now definitely regarded by him to be a new species.

The new "eelworm" bears a close resemblance to the golden nematode on potatoes, with which it was at first feared to be identical. The two "eelworms" also have different sets of host plants. The tobacco cyst nematode will not mature on potatoes, the preferred host of the golden nematode, but does mature on all varieties of tobacco tested, on *Nicotiana rustica* L., and on the black nightshade.

### Plum Curculio Control

Tests with new insecticides as foliage sprays and as soil treatments at Fort Valley, Ga., are providing the U. S. Department of Agriculture with promising leads in its search for better ways of controlling the plum curculio.

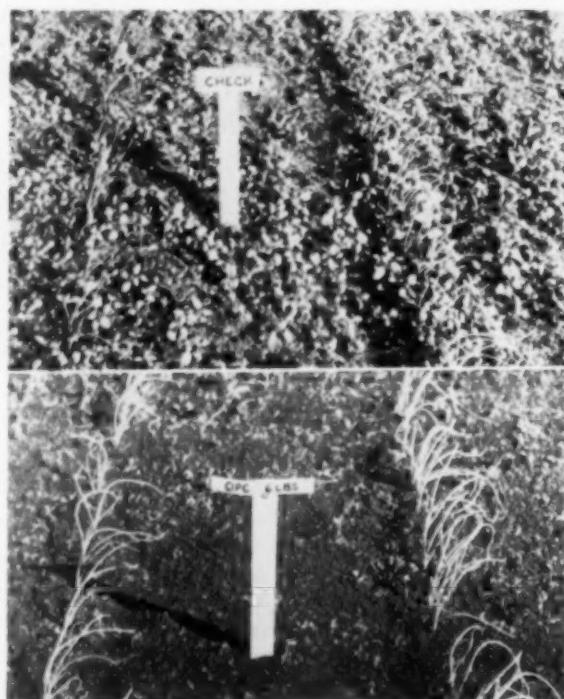
Early season spraying of peach tree foliage with dieldrin, followed by parathion sprays, is controlling this insect better than parathion sprays alone. A full-season schedule of dieldrin might leave excessive spray residues. Parathion alone is less persistent. In a different approach to the problem, it is reported that mixing aldrin or dieldrin into the soil where plum curculios pupate, destroys a high percentage of the pests.

Field-trial use of dieldrin sprays reduced the curculio infestation in peaches that dropped from the trees early in the season below that when such recommended insecticides as parathion and EPN were used. Infestations in harvested fruit treated with dieldrin followed by parathion, were as low or lower than those resulting from use of either parathion or EPN.

Other insecticides that provided excellent plum curculio control when used as sprays in more limited, single-tree tests were aldrin, endrin, and heptachlor.

### Chloro-IPC Accepted for Use On Onions, Lettuce

The new pre-emergence herbicide Chloro-IPC has been accepted by the United States Department of Agriculture for use on onions and lettuce. Comparison of its effects may be seen in the photograph at right. Top: untreated check of Onions. Soil is muck. Bottom: Post-emergence control of weeds in Onions on muck. Use directed spray of 6#/A.



USE of Chloro-IPC as a pre-emergence herbicide on onions and lettuce has been accepted by the United States Department of Agriculture and duplicate copies of labels bearing directions for use as a pre-emergence herbicide may be submitted for consideration at any time; it was announced last month by the Columbia-Southern Chemical Corporation, major producer of the new herbicide. Nearly two years of research were required to furnish the necessary residual and toxicological data to secure acceptance of Chloro-IPC for use on vegetable crops.

In granting permission for use of the new herbicide on onions and lettuce, the Department of Agriculture reported: "It does not appear that significant residues of Chloro-IPC will be present on the harvested crops when used as directed."

It is indicated that good weed control in seeded onions may be had by using four to eight pounds of

Chloro-IPC per acre on muck or four to six pounds per acre on mineral soil both as pre and post-emergence treatment. However, reduced stands have resulted in some cases with pre-emergence treatment. Post-emergence treatments (over tops) have been successful at 1½, 5, 7, 9, and 12 inch heights and when tops begin to fall over. The same treatment as above may be used for onion sets but injury is much less likely to occur from pre-emergence treatments.

For lettuce crops, one to three pounds of Chloro-IPC per acre at planting time has been successful.

Since Chloro-IPC appears to exert its maximum weed controlling effects on germinating seeds—it should be applied to the bare soil before weed seeds germinate, Chloro-IPC is usually ineffective in controlling weed seedlings or adult weeds with the notable exception of chickweed and purslane which may be killed, although slowly, by treatment at mature stages.

**correct-IRON CHLOROSIS  
prevent-IRON CHLOROSIS  
WITH Nullapon NaFe-13**

The highly concentrated iron chelate especially designed for application in fertilizer mixtures or in other diluted forms for citrus and vegetable crops.

NULLAPON NaFe-13 gives more available iron per pound for the cure of soil deficiencies. It is a technical sodium ferric ethylene-diamine tetraacetate, containing 13% minimum of metallic iron, or 18.5% iron expressed as  $\text{Fe}_2\text{O}_3$ .

An especially prepared concentrate for use by competent fertilizer or soil nutrient manufacturers, NULLAPON NaFe-13 should be diluted before use or application by thoroughly mixing with sand, fertilizer, or other suitable diluent. Consult your Agricultural Experiment Station representative before making large scale application.

*For complete information and a sample of  
NULLAPON NaFe-13, write today.*

**ANTARA**



**ANTARA<sup>®</sup> CHEMICALS**

A SALES DIVISION OF GENERAL ANILINE & FILM CORPORATION  
435 HUDSON STREET • NEW YORK 14, N.Y.

SALES OFFICES: NEW YORK • BOSTON • PROVIDENCE • PHILADELPHIA • CHARLOTTE • CHATTANOOGA • CHICAGO  
PORTLAND, ORE. • SAN FRANCISCO IN CANADA: CHEMICAL DEVELOPMENTS OF CANADA, LIMITED, MONTREAL

*"From Research to Reality"*

## Suppliers' BULLETINS

### Shell Booklet on Dieldrin

A new booklet, describing ways of killing ants with dieldrin, has been prepared by Shell Chemical Corp. The colorful publication, called "How To Kill Ants with Dieldrin," is intended for use by pesticide formulators as direct mail promotional material or for hand-out purposes.

The booklets are available in quantities from Shell, at 50 West 50th St., New York 20.

### Tips on Multiwall Storage

An easy to read booklet called "Safe Storage Tips for Multiwall Paper Bags," has been prepared by Fulton Bag and Cotton Mills for multiwall bag users. The 12-page booklet gives a colorful presentation of five important tips and a series of do's and don'ts in picture form for handling and storing multiwalls. It should be of interest to many persons in the agricultural chemicals industry who use multiwalls to package their products.

Because humidity plays a big part in preserving bag strength, the Fulton publication suggests ways of providing sufficient moisture in "dry" storage areas. Copies are available from the company, by writing on company letterhead to the general sales office, P. O. Box 198, New Orleans, La.

### Fertilizer Study Booklet

A brochure covering the effect of fertilizer usage on five major western crops was issued recently by the Washington Bankers Association. The NFA cooperated in preparing this booklet, "Fertilizer and Farm Income in Washington State," and is now working with two additional banker groups with the object of

publishing comparable booklets. The 20-page, 9 x 12 brochure, illustrates the increase in yield and quality of crops by use of fertilizer. Photographs and tables substantiate the text.



### New Ammonia Valve

A new anhydrous ammonia forged-steel combination liquid fill and withdrawal valve was announced recently by the S and L Manufacturing Co., Gardena, Calif. The valve is said to permit ready flow of liquids, with low back pressure and turbulence. S & L announce also another addition to their line of anhydrous ammonia valves and fittings, a forged steel hose line valve, which features hand shut-off.

### KVS Mills for Phosphate

The wide range of grindability of Florida phosphate concentrate and pebbles has been handled satisfactorily at the Mathieson Chemical Co., Pasadena, Tex. and the American Agricultural Chemical Co., Pierce, Fla., with installations of the Kennedy Van Saun Airswept mill. In the installations, fines are removed as they are formed, reducing the tendency to overgrind, which results

in production of unnecessary super fines. The system is said also to eliminate the dust nuisance present in other types of grinding systems.

The Mathieson grinding unit has a capacity of about 16.5 tons per hour at a fineness of 75 per cent minus 200 mesh. The unit at the American Agricultural Chemical plant has consistently averaged more than 44 tons per hour at a fineness of approximately 51% minus 200 mesh, while grinding pebble, concentrate and various combinations of the two.

### Bulletin Describes Chloro-IPC

Monsanto Chemical Co.'s organic chemicals division has prepared a technical bulletin describing formulation and application of Chloro-IPC. Available on request from the company, the booklet outlines information on herbicidal action of Chloro-IPC and lists of weeds controlled by and resistant to the herbicide.

### New Hudson Spray Boom

H. D. Hudson Mfg. Co., Chicago, have recently announced a new spray boom adaptable to spraying row or field crops. The manufacturer reports that the boom may be used to spray crops planted in rows 16 inches or less to 42 inches or more apart.

### Nursery Uses Oktone

Joseph H. Hill Co., Richmond, Ind., reports satisfactory weed control in and outside the greenhouse with "Oktone," a Goodrich Chemical Co., Cleveland, product. The Nursery owner reports use of the herbicide to clear a four-inch band around the outside of the greenhouses, to facilitate lawn mowing. The manufacturer reports that Oktone breaks down rapidly in the soil, so that repeated applications do not build up.

### Equipment Bulletin Issued

Sauerman Bros., Inc., Chicago, recently issued a leaflet on the handling of fertilizer materials. The report illustrates equipment used in the handling of organic and inorganic fertilizer, specifically: a scraper installation, controls and hoist for cleaning acidulating dens, and drag scraper.

## Calls for Continuing Pesticide Research

ALTHOUGH at the moment the nation is bothered with agricultural surpluses, it appears that within the next half century, due to rapid population increases, it may no longer be possible to tolerate current losses from insects and other plant pests. This was the message given at the recent 19th North American Wild Life Conference in Chicago, by Harry F. Dietz, representative of E. I. du Pont de Nemours & Co. "This in itself justifies the search for new and better pest control agents than we have."

"The advent of synthetic organic insecticides, the dithiocarbamate fungicides and the hormone type herbicides, 2,4-D and 2,4,5-T opened new vistas in the possibilities of controlling pests that have plagued mankind since the beginning of history. This progress, we owe to technology, and it augurs well for future progress."

Mr. Dietz described the technological procedure for development of a typical new pest control agent. The steps that must be taken before any new agent can be marketed involve four distinct phases, and the cooperation of biologists, chemists, engineers and toxicologists:

In the first step in development of a new agent the biologist, using relatively simple tests, screens candidate compounds in a laboratory or greenhouse. Further secondary screening reveals much about quantitative biological properties, such as minimum effective concentration, spectrum of activity and effect on crop plants. If these indicate that the new agent may be meritorious, further work is required to confirm this.

At this point, the toxicologist enters the procedure, to determine the effect of the agent on warm blooded animals, so that those who must further evaluate it will know how to handle it safely; also to develop appropriate precautionary information for protection of man, domestic animals and wild life.

Small-plot field tests are then made, and a formulating chemist is

called on to prepare the agent in a usable form, which may be either a wettable powder, emulsifiable solution or form to meet current application equipment requirements.

"Proper formulation," Mr. Dietz reminded, "is often quite difficult, and involves much more than merely mixing a few ingredients together and assuming that, because the formulation disperses well in water or oil, it is ready for field tests. Not infrequently the biologists testing the formulation, find that the new agent's activity has been reduced. The reason for this must be ascertained and much valuable time may be spent on this phase of the development."

Suitable formulations, when ready, are then sent to field investigators for critical evaluation under use conditions, he went on. These are designed to pick up inherent weaknesses, such as failure to perform biologically, lack of safety to crop plants, lack of necessary residual effectiveness, or undesirable handling properties of any kind. Accurate determination must then be made by the analytical chemist, of residual efficiency, residues on or in the crop plants or foods processed from these, and residues in soil.

"It is indeed remarkable," Mr. Dietz declared, "what delicate and highly accurate tests the analytical chemist can devise to detect the presence or absence of the new agent and thereby determine proper and safe use. This makes possible accurate studies on modes of action of the new agent. It supplants speculation with provable facts and gives everyone a greater peace of mind as well as assurances when safe use is a major consideration."

Field tests, he said, may continue over a period of several years and only after they prove that the new pest control agent has real merit are state and federal investigators informed and supplied with sample quantities for evaluation. One more fact must still be established,

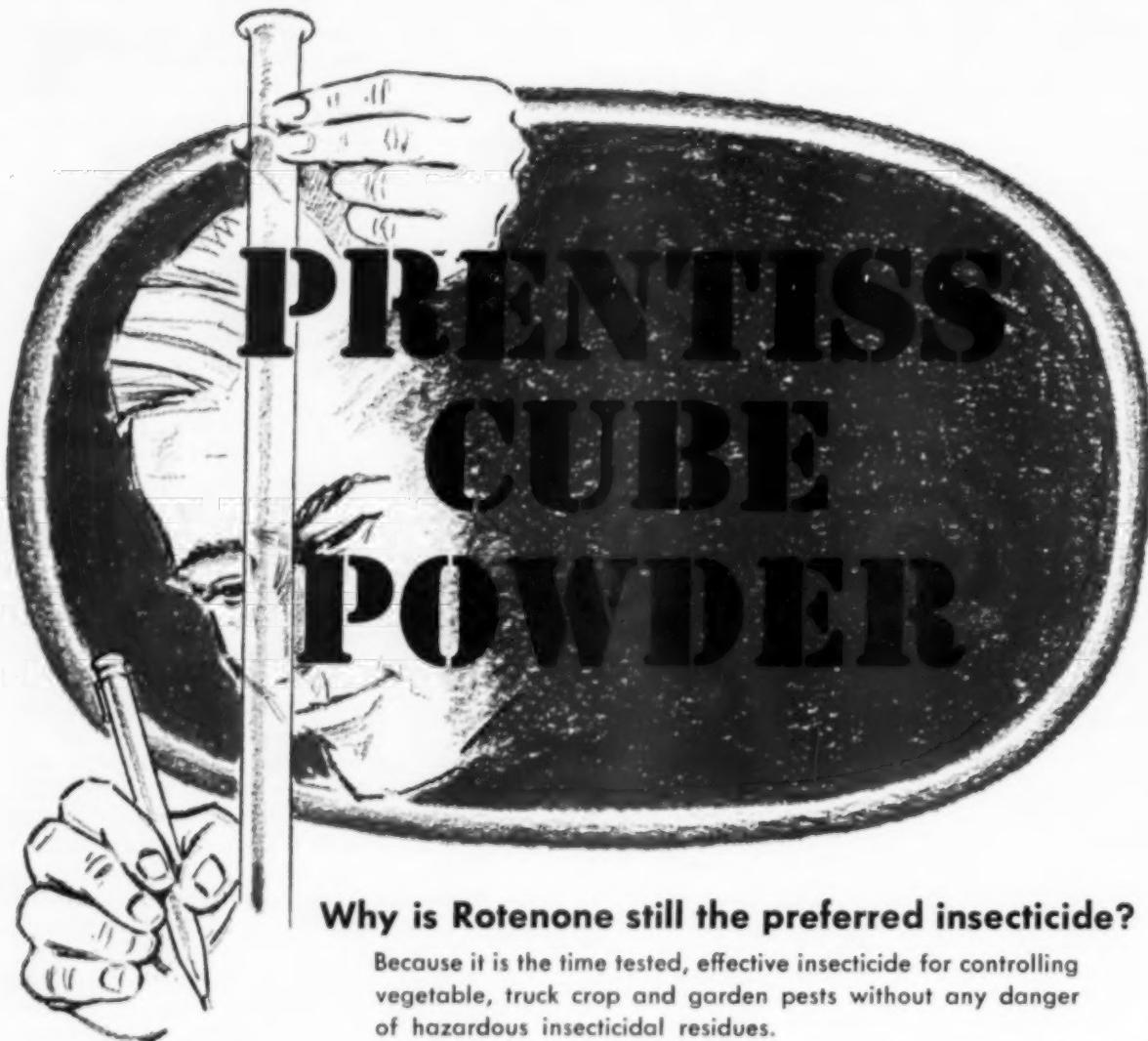
he said, namely the maximum amount that can be tolerated without injury. This study is conducted by the toxicologist over a period varying from 90 days to as long as two years.

"Up to this point," he said, "the new agent has never been given to anyone except qualified investigators. If everyone is agreed that the new agent is worth while—superior to existing products, useful in crop production or the amelioration of pest problems, can be produced and sold at an economically sound price and is safe to manufacture and use—then only is the new product ready for introductory sales." He described the requirements for registration of the new agent with the pesticide regulation section of the USDA and the emphasis placed there on safe use of the product.

"We believe," he said, "that the whole chemical industry concurs with us that there is everything to gain and nothing to lose from such a vigorous and vigilant program which has, at all times, been reasonably and fairly administered by the responsible officials of the Dept. of Agriculture and the Food and Drug Administration. Even with federal regulation in effect, further registration must also be made in most of the states before the product can be sold within their borders."

The various steps in development of a new pest control agent, Mr. Dietz said, seldom require less than five years time and the efforts of a host of investigators, while the amount of money spent on one new product is seldom less than one million dollars. This, he added, is exclusive of the cost of the necessary plant and equipment for its manufacture.

"Even after it is introduced on a restricted basis," he summed up, "any new pest control agent must be carefully and closely serviced to be sure that it is used in the right amount, in the right way and safely to meet approved needs. It is only in this way that the potentialities of a useful product can be fully realized and its place in our agricultural economy established." ★★



### Why is Rotenone still the preferred insecticide?

Because it is the time tested, effective insecticide for controlling vegetable, truck crop and garden pests without any danger of hazardous insecticidal residues.

### Why is Prentiss Rotenone Powder the preferred brand?

Because Prentox Cube is the bonus product. Every 5,000 pounds is batch blended and analyzed for Rotenone content to guarantee the insecticide manufacturers a genuinely standardized Rotenone Powder.

Use Prentox Cube Powder for your quality insecticide formulations and greater profits to you.

#### OTHER PRENTISS PEST-TESTED PRODUCTS ARE:

Rax Powder (5% Warfarin)  
for control of rodents  
Pyrethrum  
Allethrin

Pyronyl Concentrates  
Lindane  
DDT  
Chlordane

**PRENTISS DRUG & CHEMICAL CO., Inc.**

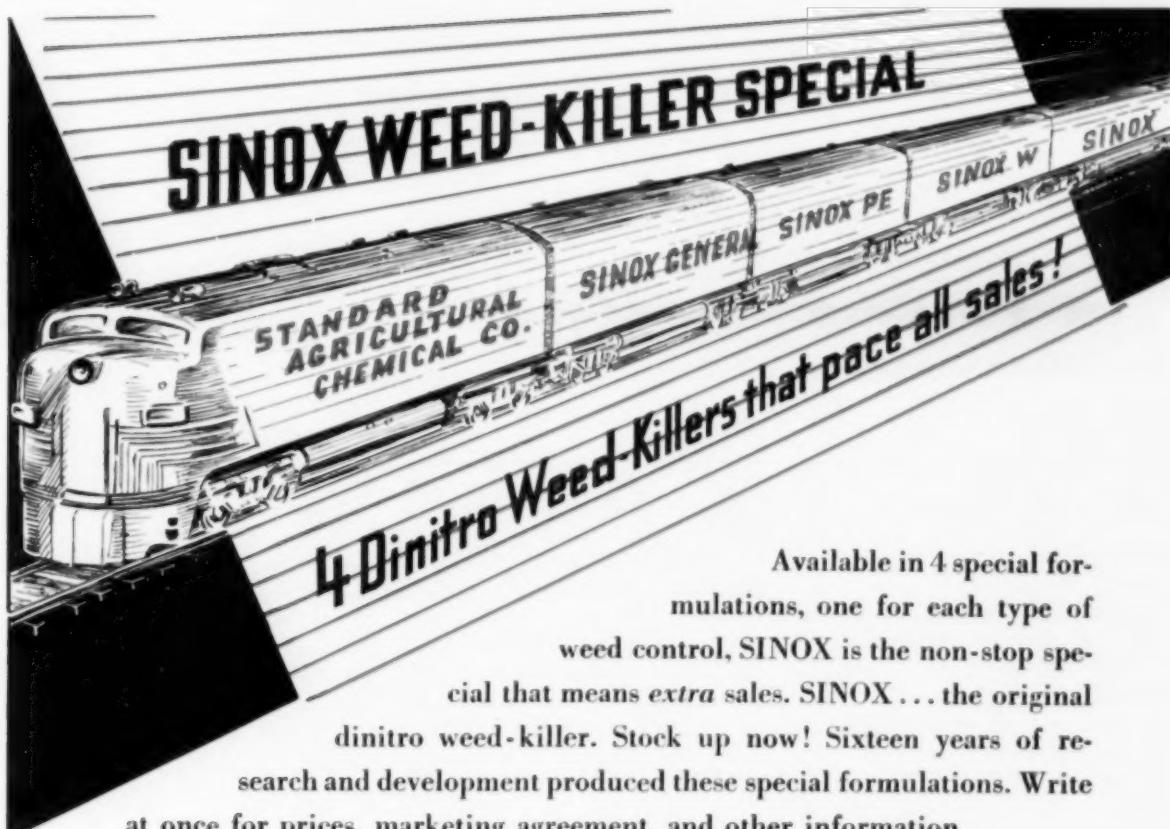
110 William Street

5 South Clinton Street

New York 38, N. Y.

Chicago 6, Ill.





Available in 4 special formulations, one for each type of weed control, SINOX is the non-stop special that means *extra* sales. SINOX...the original dinitro weed-killer. Stock up now! Sixteen years of research and development produced these special formulations. Write at once for prices, marketing agreement, and other information.

#### WEED CONTROL:

SELECTIVE  
PRE-EMERGENCE  
PRE-HARVEST

#### Check These 4 SINOX Uses

SINOX—For safe, selective weed control in onions, flax and grain.  
 SINOX W—For selective spraying of seedling alfalfa, onions, flax and grain.  
 SINOX PE—For pre-emergence spraying of cotton, beans, peas, corn and beets.  
 SINOX GENERAL—As a desiccant for Seed Alfalfa, Clovers, Sudan Grass, Milo, Flax and Peas.  
 Also used as a chemical weed mower in orchards, vineyards, ditches, etc.  
 Potato Vine Killing.

#### OTHER STANDARD AGRICULTURAL CHEMICAL PRODUCTS

##### HERBICIDES

Stantox "64"—2,4-D Amine Salt  
 Stantox "P-44"—2,4-D Ester  
 Stantox "P-50"—Low Volatile 2,4-D Ester  
 Stantox "T-45"—2,4,5-T Ester  
 Stantox "22" Brush Killer—Low Volatile Esters of 2,4-D and 2,4,5-T  
 Stantox "LV-45"—Low Volatile 2,4,5-T Ester

##### Stantox "Sodium TCA"—(90%)

Stantox MCP • Stantox IPC  
 Stantox Chloro IPC

##### DORMANT FRUIT SPRAYS

Elgetol  
 Elgetol "30"  
 Elgetol "318"

##### INSECTICIDES

Stanphos "50"  
 Toxaphene Emulsion  
 DDT Emulsion  
 Parathion Emulsion  
 Parathion Wettable Powder  
 Stanicide and others



## STANDARD AGRICULTURAL CHEMICALS, INC.

1301 Jefferson Street, Hoboken, N. J. • 429 Forum Building, Sacramento, Calif.



# HERCULES

OPENS A NEW  
AGRICULTURAL  
LABORATORY

A NEW agricultural chemicals research laboratory completed in January 1954 at a cost of about \$400,000, was officially opened April 8th by Hercules Powder Co., Wilmington, Del. Located next to the Hercules' experiment station, the new facilities will enable the company to expand its research activities in the development of new insecticides, fungicides, and plant regulatory chemicals. Paul Mayfield, general manager of the company's Naval Stores Department, reports that the Hercules researchers will be able to screen more than 300 formulations a month in the new research building.

Hercules has done screening work on new agricultural chemicals since the late 1920's. Among the best known products derived from Hercules research into rosin and terpene chemistry has been toxaphene, base for widely used agricultural insecticides. Thanite, another toxicant,

was introduced by Hercules for insecticide formulations in 1940. Other Hercules agricultural products include ammonium nitrate, anhydrous ammonia, ammonium sulfate and ammoniated solutions for use as fertilizers. Soil conditioners based on a special type of Hercules CMC will be available later this spring.

Applied research on insecticides, fungicides, herbicides, and defoliants will be carried on in the new build-

ing. Plant diseases and seed and soil treatments will be studied also.

The facilities include a main laboratory building, greenhouses, and field test plots where new agricultural chemicals will be evaluated under conditions approximating commercial usage. The laboratory is equipped with the most modern equipment, some of which was designed and built by Hercules engineers. The specially designed equip-

---

**Left:** Dr. Earl Ogle, plant physiologist, watching a herbicide spray applicator in action. Soybeans, cotton, tomatoes, corn, and millet are being treated in this test. The applicator is specially designed for the precise test application of new herbicides. The nozzle used is a standard herbicide field nozzle.

**Right:** Dr. Hugh C. Palmer, plant pathologist, spraying tomato plants with a new fungicide formulation. After the spray has dried, the plants are then sprayed with a pest fungus, and placed in constant temperature cabinets to allow development of the disease. Plants are then removed to the greenhouse where they remain until the ability of the fungicide to resist the disease is determined.





Dr. E. N. Woodbury, supervisor of research at Hercules' new Agricultural Chemicals Laboratory, checks progress of test work on new herbicide formulations. The soil surface was previously sprayed with the herbicide.

ment includes a herbicide sprayer which has a fan-type spout and runs on an overhead trolley, simulating field application as closely as can be done in the laboratory.

Another unusual feature is the air-conditioning system. No air from any of the rooms is recirculated. Also, air pressure in each test room is lower than the air pressure in the hallways, so that when a test room door is open, the air from within will not flow into the hall and into another room. Where air temperature and humidity conditions are critical, they are held to narrow limits to assure uniformity of growth of test organisms and uniform conditions of testing.

In order to keep the outside test plots free from contamination by chemical fumes, the agricultural chemicals laboratory was located some distance from the remainder of the buildings that comprise the Experiment Station. Constant temperature and humidity rooms provide uniform temperature and humidity for raising cultures of insects, fungi, and bacteria. Test rooms, similarly controlled, are used for applying experimental chemicals to determine their effectiveness against the various

cultures. Separate transfer rooms for the handling of specimens are included.

Additional facilities include special rooms for rearing houseflies, Mexican bean beetles, southern armyworms, and pea aphids. These are some of the insect pests on which the effectiveness of new insecticide formulations is tested.

Richard T. Yates, who is in charge of the sales and research activities, of the agricultural chemicals group, said that the laboratory staff of 18 is headed by Dr. E. N. Woodbury, and includes entomologists, plant pathologists, plant physiologists, agronomists, and horticulturists.

"For a number of years, Hercules has been screening new chemicals to aid the farmer. We now will be able to greatly increase the amount of this work and broaden the scope of our activities," he said.

"A group of chemists at the main Experiment Station, under the supervision of Dr. A. D. Lohr, supply the Agricultural Chemicals Laboratory with a constant stream of new chemicals. The new modern laboratory facilities enable us to put these materials through extensive tests," Mr. Yates remarked.

### Chemical Enterprises Expands

Chemical Enterprises, New York, has exercised an option to purchase all of the outstanding stock of nine fertilizer and equipment distributing companies located in Louisiana, Texas, and Washington. These units will continue to operate independently as affiliates of Chemical Enterprises. They are engaged in the distribution of liquid fertilizer, particularly anhydrous ammonia, and auxiliary equipment used in the application of liquid fertilizers.

According to Daniel B. Curril, Jr., president, the purchase price was more than \$1,000,000. Additional capital will be supplied by Chemical Enterprises, thus permitting further expansion. J. C. Berry, president of Louisiana Liquid Fertilizer Co., one of the group, will be general manager of this group of affiliated companies. The nine companies are: Dixie Liquid Fertilizer Co., Inc., Monroe, La.; Louisiana Liquid Fertilizer Co., Inc., Shreveport, La.; Texammonia Gas, Inc., McAllen, Tex.; Texammonia, Inc., Elsa, Tex.; Palouse Ammonia, Inc., Endicott, Wash.; Whitman Ammonia Co., Inc., Oakesdale, Wash.; Columbia Ammonia Co., Inc., Huntsville, Wash.; Agricultural Equipment Co., Inc., Endicott, Wash.; and Agricultural Wholesale Equipment Co., Inc., Shreveport, La.

### FFA Boys Tour DuPont

During a recent tour of industrial plants in the United States, a group of officers of Future Farmers of America visited the DuPont plant in Wilmington.

The boys learned about new developments in plant disease control at the company's greenhouse, in a tour conducted by Dr. H. F. Dietz, manager of DuPont agricultural chemicals research and Dr. Dale E. Wolf, assistant manager.

### Borax Appointments

G. C. Buskirk has been named head of a new railroad department in the agricultural sales division of Pacific Coast Borax Co. R. S. Kiesler has been named manager of the division's new office at Houston.



Experienced inspectors watch every phase of V-C's bag-making operation. Extra care in manufacturing has helped make V-C Bags famous for their toughness and stamina.



After "tubing," V-C Bags are rigidly inspected for proper seam pasting, length and size. Special care is taken to see that all surfaces are absolutely bonded.

## V-C® Quality Controls Mean Better Bags for You

**Rigid quality controls**, top-grade bagging materials, and careful construction give V-C Multiwall Bags the ability to stand rough treatment. V-C Bags are available in various styles and sizes, two-to-six ply, expertly designed and printed to your specifications in one to four colors. Write for full information, or discuss your bag requirements with a V-C representative.



**Virginia-Carolina Chemical Corporation**

**BAG DIVISION:** 9th and Perry Streets, Richmond 5, Virginia

**DISTRICT SALES OFFICES:** Atlanta, Ga. • Wilmington, N.C. • New York, N.Y. • E. St. Louis, Ill. • Cincinnati, Ohio

## INDUSTRY *News*

### **Phytopaths to Colorado**

The 46th annual meeting of the American Phytopathological Society is scheduled for August 25-27th, at the YMCA Conference Camp in Estes Park, Colo. The technical program has not been made up as yet, and members wishing to present papers at the meeting have until June 15th to submit abstracts of proposed reports to Dr. Paul Miller, USDA, Beltsville, Md.

The Pacific Division of the APS will hold its meeting along with the national convention. A joint session with the Potato Association of America is planned for the final day of the meeting.

### **Grace-Davidson May Merge**

The merger of Davidson Chemical Corp., into W. R. Grace & Co. has been approved by Grace directors. Grace stockholders are to vote on the proposal at a special meeting May 12th in New York.

### **Canada Budworm Program**

For the third consecutive year, Central Aircraft, Inc., of Yakima, Wash., will have the largest American share of spruce budworm spraying work to be done in eastern Canadian forests this summer. Central will furnish 10 spray planes, pilots, maintenance crews, and other services for the annual project. About 1,250,000 acres are to be sprayed in Quebec and New Brunswick.

Other U. S. operators who will send aircraft to the budworm project

### **Benson Visits Cornell**

Sec. of Agriculture, Ezra Benson, (left), recently visited the Cornell University Campus. Dr. C. E. Palm (right), head of the entomology department, reviews work done by the Cornell researchers.

Illustrated is an exhibit on the alfalfa snout beetle, found nowhere in the U. S. except Oswego and Jefferson counties, New York. This pest causes serious damage to alfalfa and clover sod. Cornell research has developed improved

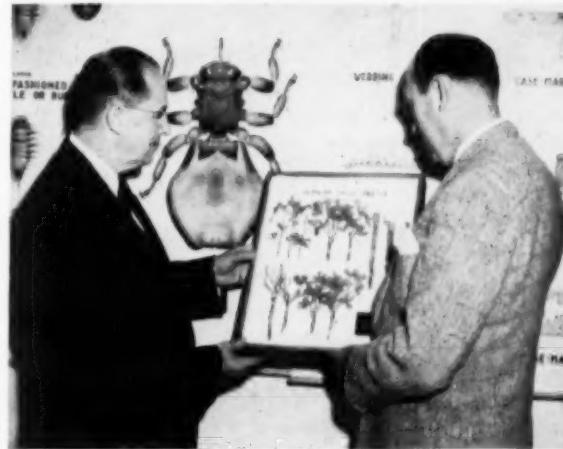
in Canada this year include: Farm Air Service, Medford, Ore.; Hammer Crop Dusters, Sacramento; Quaadman Duster, Corcoran, Calif.; Marsh Aviation, Phoenix; and Aero Agricultural Service, Alice, Tex.

### **Horne Joins Chipman**

A recent announcement from Chipman Chemical Co., Bound Brook, N. J., advises that Donald E. Horne has joined their sales staff. Mr. Horne, a native North Dakotan, will be in charge of the company's sales in the states of North and South Dakota and Minnesota.

### **NFA Plans Va., Mo. Tours**

The Plant Food Research Committee of the National Fertilizer Association plans field trips May 19-21 in Virginia, and June 7-9 in Missouri.



control methods that have arrested spread to other areas.

B. S. Chronister, Allied Chemical & Dye Corp., Nitrogen Division, New York, is in charge of arrangements for the Virginia tour. W. Gull, Spencer Chemical Co., is in charge of arrangements for the Missouri field trip. Fertility plots, on corn, pastures and small grains are included in the itinerary.

### **Stauffer Consolidates Divs.**

The Stauffer Chemical Co., New York, announced late in April the consolidation of its Florida division with its southeastern area, incorporating the states of Georgia, Alabama, eastern Tennessee, North Carolina and South Carolina. Melton T. Pearson, who has been in charge of the southeastern area has been appointed manager of the newly combined area by Ernest G. Homes, sales manager of the southern region.

### Alderfer Succeeds Bear

Dr. Russell B. Alderfer, professor of soil technology at Pennsylvania State University, will succeed Dr.



RUSSELL B. ALDERFER

Firman E. Bear as chairman of the Department of Soils at the N. J. Agricultural Experiment Station, July 1, according to Dr. William H. Martin, director. Dr. Bear's retirement was announced on April 15th (see page 58).

Dr. Alderfer, 40, was born in Lansdale, Pa. He received his bachelor of science degree from Penn State in 1936 and went on to his M.S. in 1940 and his Ph.D. in 1947. Both

advanced degrees were in the field of soil technology. During his service at Penn State he has conducted investigations dealing with the physical properties and management of fruit, vegetable, pasture and farm crop soils. He has been in charge of soil and water conservation investigations throughout Pennsylvania. His teaching work at the University has been in soil physics, soil and water conservation, and soil management.

### Int'l Min. Forms New Dept.

A new feed ingredients sales department in the Phosphate Chemicals Division of International Minerals & Chemical Corp., Chicago, was formed last month. Gladwin A. Read, formerly sales manager of the feed phosphates department, has been made manager of sales development in the new department, and will have full responsibility for sales planning, promotion, and advertising.

John K. Westberg, has been made manager of field sales. He was formerly special products sales manager of International's Amino Products division, selling the animal feed supplement, MC-47. The new department will incorporate the former feed phosphates department.

### Fertilizer Mfrs. Query FOA On Purchases for Overseas

The Foreign Operations Administration pointed to its orders from Congress to procure commodities wherever in the free world they can purchased at the cheapest competitive price, in turning down the request of the U. S. fertilizer industry that the agency limit its purchases of fertilizer for overseas programs to domestic producers. The FOA is, however, considering changes in policy relative to other phases of the problem, which may provide some relief to producers seeking to compete with foreign suppliers.

The problem was discussed at the February 25th conference by superphosphate and ammonium sulfate producers with the Business and Defense Services Administration. At the conference, American producers emphasized strongly that they are con-

tinually being outbid by foreign fertilizer suppliers for the business of fulfilling overseas FOA relief programs. One point brought out in the controversy is based on the requirement of the law that at least 50 per cent of FOA shipments move in American flag vessels; this places the American fertilizer producers at a disadvantage, with respect to freight costs, since the rates on American vessels are generally higher than those on foreign vessels.

The FOA is considering that proposed bid invitations specify quotations on an f.a.s or f.o.b. port of origin basis at bidders' option. It indicated also that it would investigate any complaint that supplies purchased from foreign sources may have come from behind the Iron Curtain.

### Penn Indl. Names Wolfe

Lester J. Wolfe has been appointed Chicago district sales manager of Pennsylvania Industrial



L. J. WOLFE

Chemical Corp., Clairton, Pa. Prior to joining PICCO as a sales executive last August, he was assistant manager of sales of General Chemical Division, Allied Chemical & Dye Corporation. He also has served as director of sales for Man-Gill Chemical Co., Cleveland.

### Conn. '54 Gypsy Moth Program

Gov. John Lodge of Connecticut in April authorized 40 per cent state aid to towns to help finance the cost of spraying for gypsy moths this season. This perennial Connecticut pest now threatens about 200,000 acres of central and western Connecticut woodlands. The estimated cost of spraying is \$1.40 per acre. DDT will be sprayed by airplane, as soon as the towns approve the plan, and appropriate funds for local costs.

### TVA Ammoniators in Use

Tennessee Valley Authority reports in its April 14th newsletter that the TVA continuous ammoniator, developed about a year ago, for including nitrogen in mixed fertilizer is being used in various plants throughout the country. TVA installations are located in Kansas, Washington, Indiana, Texas, South Dakota, Ohio, Illinois, Missouri, Minnesota, Pennsylvania, Wisconsin and Nebraska.

## **Systemics, Defoliants, Herbicides, Control Problems, Discussed at Cotton Conference**

**R**EPORTS on weed control, disease control, defoliation, and soil fertility highlighted results of test work described at the third annual Western Cotton Production Conference held April 13 and 14 at the Hotel Westward Ho, Phoenix, Ariz. Clyde Wilson, president of the Arizona Cotton Growers Association, and Cecil H. Collerette, president of the Southwestern Five-States Cotton Growers Association opened the conference meeting.

A panel discussion stressed damage caused by the cotton root-knot nematode in the Southwest. It was estimated that in 1953 this pest resulted in 25,000 acres of Arizona crops showing losses ranging from light to moderate. The cotton root-knot nematode causes a galling of the roots which disrupts the movement of water and nutrition, according to H. W. Reynolds, Agricultural Research Service, Sacaton, Ariz. Other panel members included J. T. Presley, USDA, Beltsville, Md.; I. J. Shields, Ariz. Agricultural Extension Service; P. J. Leyendecker, New Mexico Agricultural Extension Service; and R. B. Streets, University of Arizona. George W. Spence, El Paso Cotton Growers' Association, and J. Russell Kennedy, Calcot, Ltd., presided at the April 13th sessions.

Breeding cotton to withstand verticillium wilt was outlined by George J. Harrison of the California Planting Cotton Seed Distributors. He reported that the cotton varieties known as Hopi and Hirsutum, have shown the highest tolerance yet achieved.

H. F. Miller, Jr., USDA, Shafter, Calif., reported that flame cultivation, and early post-emergence oiling—if used properly—can be used to lower both man-hours per acre and costs in the control of weeds in irrigated cotton.

MAY, 1954

control by most entomologists who have made a thorough study of this insect. Such cultivation should include abandoned field borders, ditch banks, and road sides, he added.

### **Herbicide Outlook Is Good**

**I**N a panel discussion on weed control, it was pointed out that good control by using geese to feed on the weeds in cotton fields is difficult to obtain. Geese are selective weeders "and if starved to it, will eat cotton in preference to bindweed, white horsetail, nutgrass and other unpalatable perennials," according to J. Wayne Whitworth, USDA, State College, New Mexico. Others participating in this weed-control panel included W. A. Harvey, Calif. Agr. Extension Service; Fred Arle, USDA, Arizona; and P. J. Lycly, Texas Experiment Station Number 17.

The outlook for chemicals in weed control—as in cotton diseases—is good, said W. B. Ennis, Jr., USDA, State College, Miss. However there is a need for expanded research to keep pace with problems constantly arising in the field of weed control, he added.

"In order to develop sound guiding principles for the use of new chemicals, fundamental knowledge is needed on (1) how and why certain chemicals behave as herbicides, and (2) the influence of soil and environmental factors on the action and behavior of the herbicides, and (3) the responsiveness of weeds and crops to different kinds of treatments. The research men in state, federal and private agencies are attempting to meet the challenging problems and it is reasonable to expect that within a relatively short time the application of herbicides to cotton will be an integral part of the production practices on most cotton farms."

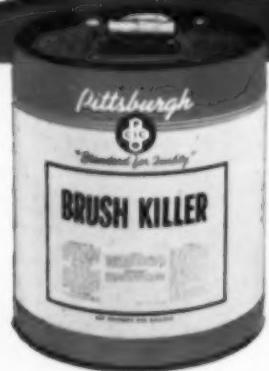
### **Systemics Evaluated**

**T**HE roll of systemic insecticides was described by Dr. H. T. Reynolds, Univ. of California, who summarized highlights of cotton research in the West during 1953. Systemics can be applied as sprays,

(Turn to Page 88)

# Sell More in '54!

## Sell Pittsburgh Low Volatile BRUSH KILLERS!



*Standard for Quality*

**ORGANIC INSECTICIDES:** Benzene Hexachloride, Toxaphene, and DDT.

**ORGANIC PHOSPHATE INSECTICIDES:** Parathion Wettable Powders, Parathion Liquid Concentrate, Systox.

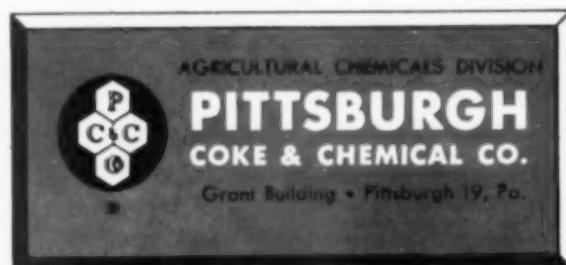
**WEED KILLERS:** 2,4-D Acid, 2,4-D Amine Concentrates, 2,4-D Ester Formulated Concentrates, D4 (Low Volatile 2,4-D Ester), C4 Pre-Emergence Weed Killer, 2,4,5-T Formulations.

**FUNGICIDES, SEED DISINFECTANTS, COTTON SPRAYS AND DUSTS, AND OTHER SPECIAL AGRICULTURAL CHEMICALS.**

Killing brush with chemicals is no longer a novelty. In 1954, more growers than ever will use this easier, more effective way of clearing fence rows, roadsides, ditches and pasture land. So be prepared to get *more* of these sales by handling Pittsburgh Low Volatile Brush Killers. Their new, improved low volatile Isooctyl esters give your customers maximum protection against vapor hazards. And this powerful Pittsburgh sales program gives you maximum assurance of healthy sales and profits!

(1) You can count on top quality and fast deliveries because we're a *basic* producer. (2) Pittsburgh Brush Killers are field-tested for peak performance right in your area. (3) A complete advertising program backs your sales to the hilt. Is it any wonder everyone's saying, "Sell Pittsburgh and you'll Sell More in '54!" Write for the complete story now!

WD 3030



COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

ANOTHER

Fulton

FIRST . . .

# FUL-FLEX NON-SIFTING SLEEVE FOR MULTIWALL PAPER BAGS!

• NEW DESIGN

Here's a sleeve that's larger than any similar type; completely engineered by Fulton to reduce sifting.

• TIGHTER SEAL

Special flexible paper combined with Fulton's new design, gives extra tight sealing action.

• SEATS SECURELY

With its longer edge, the sleeve is sewn in more securely; slipping and unseating is eliminated.

• NO INCREASED COST

Fulton's newest development—the Ful-Flex Sleeve—is available at regular prices.



"FIRST with the FINEST"

**Fulton**  
BAG & COTTON MILLS

ATLANTA • DALLAS • DENVER • KANSAS CITY  
LOS ANGELES • MINNEAPOLIS • NEW ORLEANS • NEW YORK  
ST. LOUIS • SAVANNAH • PHOENIX • SAN FRANCISCO  
WINTER HAVEN

Write TODAY For Further Details!

Fulton Bag & Cotton Mills • Dept. A  
General Sales Office, P.O. Box 198  
New Orleans 3, La.

Please forward more information on Fulton's Ful-Flex Non-Sifting Sleeve.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

in irrigation water or painted on the trunks of trees, Dr. Reynolds explained. Tests with radioactive tracers have shown that the chemicals are absorbed by the sap system and carried to all parts of the plant.

Systemics developed to date appear to be specific in their toxicity to certain groups of insects or mites. Best results so far have been with most species of mites, aphids and mealybugs. Moderate toxicity has been found in tests with certain species of scales, thrips, leafminers and leafhoppers.

#### Panel Discusses Defoliation

A PANEL discussion highlighted the final sessions with an outline of the practical aspects of using chemical defoliants on cotton to facilitate mechanical harvesting.

"When the western cotton grower wants to condition his crop for harvest he has a choice of three distinct procedures. He can harvest his crop without treating the leaves, he can apply chemicals for making them shed or he can apply chemicals to dry out the foliage," reported W. H. Tharp, USDA, Beltsville, Md.

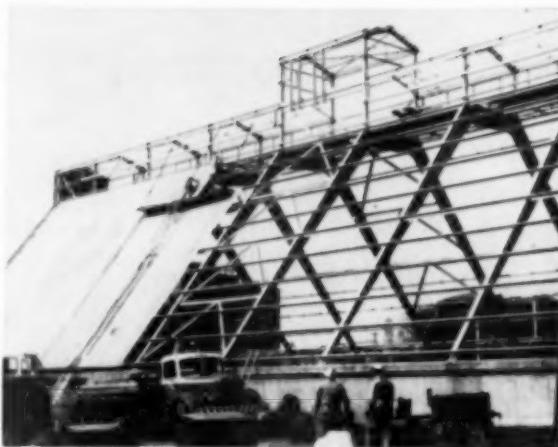
Vernon L. Hall, Chipman Chemical Co., told the conferees that defoliated cotton allows for increased exposure to the sun, giving increased drying action which opens mature bolls faster.

"The drying action also reduces boll rot and retards both fiber and seed deterioration which are encouraged by high moisture conditions. Machine harvesting is more efficient in well defoliated cotton, because the plants are free of leaves which would clog spindles. Also, leaf-free plants allow the operator of a mechanical harvester to have a clearer view and keep his machine centered over the row, Mr. Hall explained.

#### New Iowa State Films

Two new films, on seed management through insect control and cutworm control, have been produced by Iowa State College Agricultural Extension Service, under the technical direction of extension entomologists. Both films are 16 m.m. in color with sound.

A flat roof surface, running to a flat peak at the center, forms a practical design for covering cone-shaped piles of material, with a minimum of wasted space. The angle of the roof is different from that of material, protecting against contact between roof and material.



#### New Fertilizer Storage Plan

A new type storage building was erected recently for Filtrol Corp., Vernon, Calif., which will house a maximum of 10,000 tons of chemical fertilizer. The new design features an angular profile, which is a distinct departure from the traditional "bow string" type curved roof warehouse. Dimensions are 170 ft. long, 70 ft. wide, and 60 ft. high.

Two straight, flat roof surfaces running to a flat peak in the center will cover cone-shaped piles of material with a minimum of wasted space. The normal angle of repose of the chemical to be stored is slightly less than that of the roof planes. This insures against contact between the roof and stored material, although the structural steel beams supporting the roof are treated to resist any effects from possible contact with the fertilizer.

Due to the severe corrosive action of the fertilizer to be stored, Transite was selected in place of metal for the roof and end covering. Without the corrosion problem, metal sheeting would have been satisfactory, and the weight and cost much reduced. Four openings in the storage floor will feed the stored chemical to a sub-floor conveyor belt for elevator delivery to the roof and from there via belt to the bagging building.

In the event the material may not be free-flowing, a bulldozer may be brought in by way of a ramp, which leads into one end of the building and descends to the storage

floor. The material can be reclaimed, delivered to a concrete elevator shaft, and raised to the roof, and out of the building.

#### Alrose-Geigy Merge

The Alrose Chemical Co., Cranston, R. I., has merged into its parent organization, Geigy Chemical Corp., and will operate as Alrose Chemical Co., Division of Geigy Chemical Corp. Alrose, which produces and sells organic chemicals and specialties, is currently expanding its plant facilities for the manufacture of new products. The announcement of the merger was made early in April.

#### '54 Green Pastures Tour

The 1954 Green Pastures Spring Tour is scheduled for May 4-6, and includes six stops in Kentucky. These include the Willis Stout Farm, Jefferson County; Bennett Bros. Farm, Bullitt County; Edward Bickett Farm, Meade County; Goodman Bros. Farm, Breckinridge County; and Richard T. Smith, Hopkins County.

The annual tour will close with a banquet and discussions of green pastures data.

#### N.S.C. Reports '52 Surveys

The fertilizer section of the National Safety Council distributed early in April the 1952 surveys of the fertilizer industry's accident experience. The data include a comparison of accident experience in various sized plants, and in plants classified by plant-type.

## Pacific Branch ESA to Bend, Ore.

By Charles Starker

SOME 300 Entomologists from the western portions of the United States, British Columbia and Hawaii will gather at Bend, Oregon, June 22, 23, 24, for the second annual meeting of the Pacific branch, Entomological Society of America (38th of the Pacific branch). Headquarters will be the Pilot Butte Inn.

An interesting program of invitational papers has been planned by Dr. P. O. Ritcher, program chairman. Specific phases of the centennial year of professional entomology in the United States will be covered by three of the invitational speakers. Dr. H. H. Ross, president of the Entomological Society of America, "Our National Society in the Centennial Year", Dr. Al Boyce, director of the Citrus Experiment Station, Riverside, Calif., "One Hundred Years of Insect Control by Chemicals.", Prof. E. O. Essig, University of California, Berkeley, "Some Historical Aspects of Pacific Coast Entomology".

Other invitational speakers and their topics include Dr. Ralph Macy, Reed College, Portland, Ore. "Food Habits of Lepidoptera", Dr. M. M. Barnes, Citrus Experiment Station, Riverside, Calif. "Specificity of Acaricides", Dr. B. G. Thompson, Oregon State College, Corvallis, "An Entomologist in Iran", and Dr. E. F. Knipling, Bureau of Entomology and Plant Quarantine, Washington, D.

C., "The Reorganization of the Bureau of Entomology and Plant Quarantine".

### Panel Discussions Planned

R. T. R. Chamberlin will moderate a panel on "Entomology in the Roaring Twenties", fellow panel-members include Dr. Lon Hawkins, Dr. H. A. Scullen, Dr. R. L. Webster, L. P. Rockwood and W. W. Yates.

Various phases of soil insecticides and their ramifications will be discussed by Harry Lange and his panel of M. C. Lane, Ed Litooy, H. E. Morrison and Mrs. Lois Sather. A third panel on "Integration of Laboratory and Field Work" is planned, but names of all participants are not available as we go to press.

The final listing of submitted papers will not be completed until shortly before the meeting date, but sections on Insect Ecology, Insect Biology and Systemic Insecticides are planned. Movies on various phases of entomology will be shown concurrently with the general paper-reading sessions.

A buckeroo breakfast will be featured one morning during the convention. A banquet, including a floor-show and dancing, is planned by the arrangements committee for the night of June 23rd. Special tours to the many local scenic spots have been arranged for the ladies.

A. BOYCE

H. H. ROSS

E. F. KNIPLING



### Potash Background Clarified

The Potash Export Association has called our attention to an error in an article on the history of the Association, appearing on pages 12, 13 of the April issue of Agricultural Chemicals.

The article indicated that the domestic potash industry began with the discovery of potash deposits in Carlsbad, New Mexico, in 1926. The Association points out that the American Trona Corp., now the American Potash and Chemical Corp., developed their process for producing 60% muriate of potash from the brines of Searles Lake, Trona, Calif., during World War I, when the U. S. was cut off from its normal German sources of potash. First production was shipped from Trona in October, 1916.

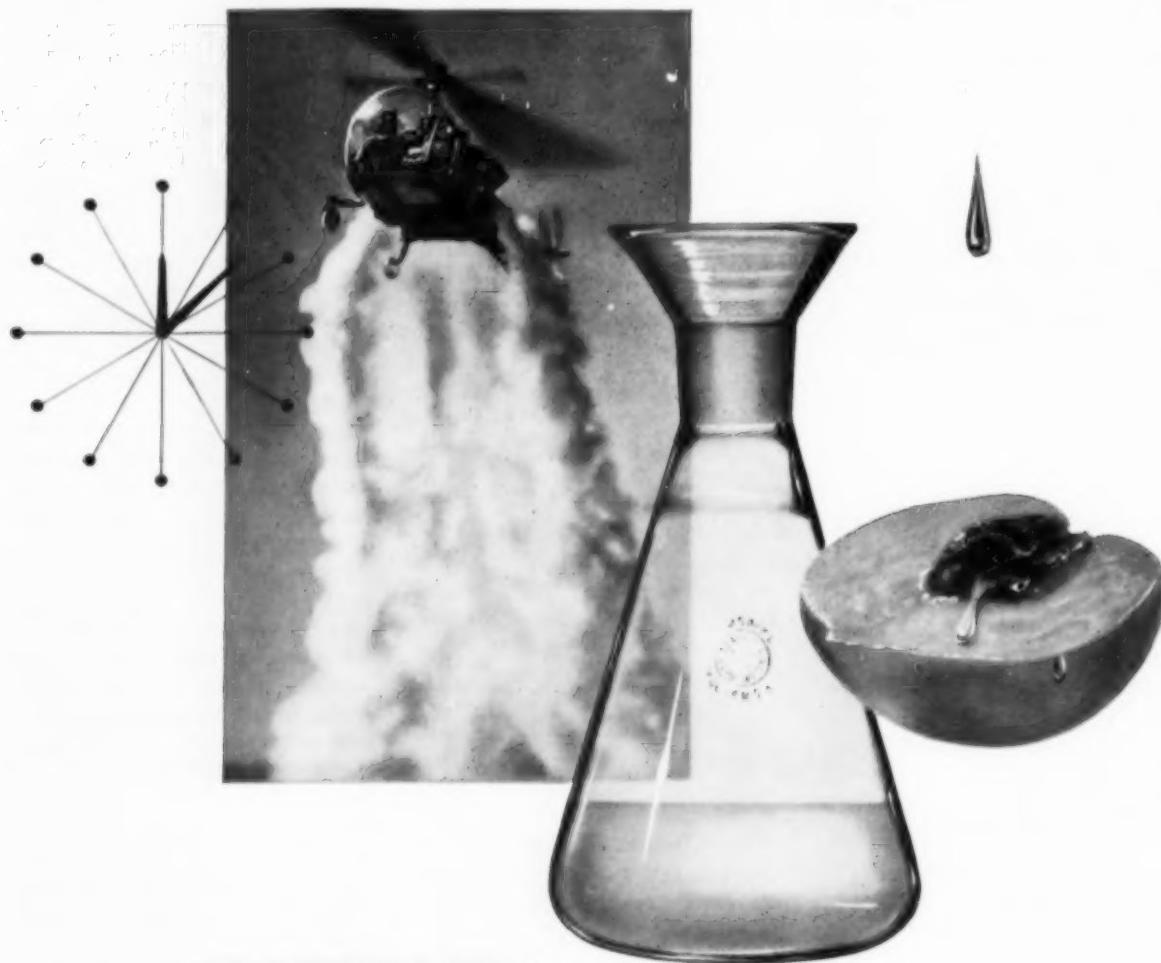
Discovery of the potash deposits in Carlsbad in the mid-twenties was the basis of a greatly expanded domestic potash industry. The United States Potash Co. was the first to enter this field, with production beginning in 1931, followed by the Potash Co. of America, and the International Minerals and Chemical Corp., known at that time as the Union Potash and Chemical Corp.

Two OKLAHOMA COMPANIES, Chemical Warehousing Co., Oklahoma City, and the Oklahoma Fertilizer & Chemical Co., have merged and will operate as the Chemical Warehousing Co., the secretary of state's office reported in April.

R. W. MOISTER has been appointed resident sales representative in the central district office of Michigan Alkali Division of Wyandotte Chemicals Corp. He will live in Atlanta and will work in seven southeastern states.

W. WARD JACKSON has been named a vice president of Commercial Solvents Corp., New York, it was announced April 29th by J. Albert Woods, president. Mr. Jackson will direct the company's Petrochemicals Division.

# The Case of the Vanishing Poison



## TEPP\*

*for pest-free, poison-free crops at lower cost*

This insecticide leaves no poisonous residues on the crops or in the soil. It kills, then vanishes—and the crop can be harvested within 48 hours!

TEPP is swift-acting, powerful, extraordinarily effective against red spider mites, aphids, flea beetles, thrips, leaf-hopper nymphs, cabbage caterpillars and many other pests.

Fewer applications are needed, crop losses are reduced to a minimum. Crops arrive at markets or

processing plants cleaner and in better condition.

Some users are saving from  $\frac{1}{2}$  to  $\frac{1}{3}$  of the cost of insecticides and their application by using TEPP formulations exclusively.

TEPP is available as a liquid concentrate and as a stabilized dust. It can be combined with other active ingredients.

Make sure your line includes formulations containing TEPP. For the names of manufacturers of TEPP, write to Eastman Chemi-

cal Products, Inc., Chemicals Division, Kingsport, Tennessee.

\*Tetraethyl Pyrophosphate is made from triethyl phosphate—an Eastman chemical. TEPP is not supplied by Eastman Chemical Products, Inc.

**Eastman**  
CHEMICAL PRODUCTS, INC.

KINGSPORT, TENNESSEE  
subsidiary of EASTMAN KODAK COMPANY

### **Endrin Approved for Tobacco**

Endrin, has recently been granted label acceptance by the U. S. Department of Agriculture for use against tobacco hornworms, tobacco budworms, fleahoppers and grasshoppers. In a liquid formulation, or as a one per cent dust, .2 to .4 pound-per-acre dosages are suggested as adequate for the protection of growing tobacco plants.

### **British Insecticide Bombs**

The British firm of Tiltman Langley Laboratories, Ltd., are now making parachute-equipped, pesticide time bombs, which will be dropped in Central African lands, to control the tsetse fly. The "bomb" holds 5 lbs. of benzene hexachloride or DDT . . . in a two-compartment container, and is ignited by a time fuse-percussion cap, that can be set for any time up to 14 hours. A 21-inch parachute lowers the bomb at 50 ft./second.

### **Motomco Announces Pivalyn**

Motomco, Inc., New York, agricultural chemical specialties manufacturers, announced recently the commercial production of "Pivalyn", a water soluble product for rodent control. Pivalyn is marketed in individual foil packets, which will each make a quart of liquid bait.

### **New Int'l Minerals Plant**

International Minerals & Chemical Corp., Chicago, recently held a press tour of its new Bonnie phosphate chemicals plant near Bartow, Fla. The \$15,000,000 plant is expected to produce 100,000 tons of dicalcium phosphate annually.

### **Rohm & Haas Lowers Prices**

Reduced prices on Triton X-100, were announced recently by Rohm & Haas Co., Philadelphia. Reductions, which take effect immediately, are as follows: tank truck and tank car lots, from 31½ cents to 28¾ cents per pound; truckload and carload lots in drums, from 33½ cents to 30½ cents; less than carload in drums, from 36 cents to 32 cents. Triton X-100 is used in agricultural emulsifiers and in other applications.

Reduction of the prices of Triton X-102, Triton X-114, and Triton X-138, became effective at the same time.

### **Neville Elects Evans**

Lee V. Dauler, president of Neville Chemical Co., Pittsburgh, announced the election of Alan S. Evans, Jr. as vice president—sales. He will assume his duties at Neville on May 10. Mr. Evans was formerly manager of the Coal Chemicals Div., Pittsburgh Coke and Chemical Co.

### **Campaign for Crag**

"Now you can prevent weeds," will be the theme of a campaign planned by Carbide and Carbon Chemicals Co., for its weed killer, Crag Herbicide-1.

The herbicide was introduced on a limited test marketing scale in 1953. It has been used to prevent broadleaved and grass weeds on farms for more than four years. Now the company is booming it for the home garden trade.

## **FORMULATORS! MANUFACTURERS!**



- \* DEPENDABLE SERVICE
- \* YEARS OF EXPERIENCE
- \* CONTINUOUS RESEARCH
- \* TROUBLE-FREE PRODUCTS

**STAUFFER SULPHURS**  
ALL GRADES OF DUSTING AND WETTABLE SULPHURS

**DDT TECHNICAL**  
FLAKE • LUMP • POWDER

**BHC TECHNICAL**  
AVAILABLE IN 24 GAMMA AND IN 36-40 GAMMA

**CONCENTRATES**  
DDT • PARATHION • MALATHION • CHLORDANE  
BHC • ALDRIN • DIELDRIN • TOXAPHENE

*"Stauffer—the sure way to be sure!"*

**STAUFFER CHEMICAL CO.**

380 MADISON AVENUE, NEW YORK 17, NEW YORK  
636 California St., San Francisco, Calif. • 221 N. LaSalle St., Chicago 1, Ill.  
824 Wilshire Blvd., Los Angeles 14, Calif. • P.O. Box 7222, Houston 8, Texas  
Weslaco, Texas • Apopka, Florida • N. Portland, Oregon



# PARATHION

Parathion was invented by Dr. Gerhard Schrader of Farbenfabriken Bayer A.G., Leverkusen, Germany. More recent Bayer agricultural chemical developments include methyl parathion, SYSTOX\*, and CHLORTHION.

Chemagro Parathion is manufactured under license from Bayer, by the Bayer process and in a plant designed specifically for that process.

It is priced at \$1.62 per pound in the East, \$1.64 per pound in the West, FOB plant or warehouse with freight allowed to destination. Minimum shipping quantity, 500 pounds.

\* REGISTERED TRADEMARK OF CHEMAGRO CORPORATION

**C H E M A G R O      C O R P O R A T I O N**

101 PARK AVENUE, NEW YORK 17, N.Y.



Wm. J. GEHWEILER

#### Gehweiler Joins Vanderbilt

William J. Gehweiler recently joined the specialties department of R. T. Vanderbilt Co., New York, where his activities will be centered on technical sales and development of agricultural diluents and adjuvants, including "Pyrax ABB" pyrophyllite, "Continental" clay, and the "Daran" dispersing agents. Mr. Gehweiler worked formerly on the white fringed beetle control project of the B.E.P.Q. He is a veteran of World War II. He received his M.S. in entomology at North Carolina State College of Agriculture and Engineering.

#### NC ESA Proceedings Available

Secretary-treasurer of the north central branch of the ESA, Roy W. Rings, advises that the proceedings of the recent meeting held in Omaha, Neb. (*Agricultural Chemicals* April, 1954, pp 51-53) will be published shortly and may be ordered now through him, at a cost of \$3.00. Mr. Rings is with the Ohio Agricultural Experiment Station, Wooster, Ohio.

#### Henry C. Aaron Dies

Henry C. Aaron, district sales manager of International Minerals & Chemical Corp.'s Potash Division's southwestern territory, died suddenly at Shreveport, La., on March 25. He was 47 years old. Prior to joining International Minerals & Chemical Corp. in 1944, Mr. Aaron was with North American Fertilizer Co., Louisville, from 1929 to 1935, and with Cumberland Chemical Co., Hopkinsville, Ky., from 1935 to 1944.

#### Marietta Opens Lab.

Marietta Concrete Corp. has opened a new research and product development laboratory at its plant in Marietta, O., to develop and test new products and to maintain a high standard of quality in existing products.

The new lab is housed in a one-story building containing approximately 1000 square feet of floor space. It includes two offices and laboratory facilities for testing the company's products.

#### New Liquid Fert. Plant

Idaho farmers last month were assured additional quantities of liquid fertilizer when production was started at the new N'land Industries, Inc., plant at Craigmont, Ida. E. W. Hansen, manager of the company, said N'land's home office is in Lewiston. The liquid fertilizer is being marketed under the name N'land Aqualizer.

The firm also plans to build and install continuous ammoniators for fertilizer manufacturers in the area, Hansen reported.

## CHEMICALS FOR AGRICULTURE

✓ Check High Analysis Value

### COPPER SULPHATE

Crystals

Superfine

Powdered

Basic Copper Sulphate

✓ 53% Copper as metallic

### ZEE-N-O

Neutral Zinc 56% Zinc as metallic

The Highest Test Nutritional Zinc

If you use Zinc Sulphate be sure to check

✓ Greater Performance and Lower Cost of Zee-N-O

### MANGANO

Neutral Manganese

55% Manganese as metallic

The Highest Test Nutritional Manganese

✓ Greater Performance and Lower Cost  
Non-irritating to Workmen

W. R. E. ANDREWS SALES, INC.

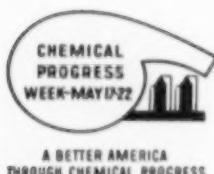
1505 Race Street, Philadelphia 2, Pa.

Since 1926

Agricultural Chemical Specialists

**HOW  
TO HELP  
COTTON  
GROWERS  
MAKE MORE  
PROFITS  
PER ACRE!**

*Encourage your  
growers to use  
**CHLORO-IPC**  
and **BHC** for  
more cotton  
per acre . . .  
cheaper!*



A BETTER AMERICA  
THROUGH CHEMICAL PROGRESS

## **Chloro-IPC** HERBICIDE

Isopropyl N (3-Chlorophenyl) Carbamate

Chloro-IPC, pioneered by Columbia-Southern, represents one of the greatest agricultural advancements in the last 20 years. When sprayed on the ground simultaneously with the planting of the cotton seed, Chloro-IPC controls weeds before they emerge. Hoeing costs are reduced up to 90%. Cotton plants are bigger and stronger and produce maximum yield.

In Louisiana, a grower of 400 acres of cotton reports that Chloro-IPC treated cotton costs him only \$1.18 an acre to hoe as compared with \$15 to manually hoe an untreated acre.

Chloro-IPC has proved itself so effective that one Southern banker is willing to loan \$2 more per acre if the farmer will use Chloro-IPC in his cotton plantings.



## **BHC** INSECTICIDE

Benzene Hexachloride

Three carloads of Columbia-Southern BHC, when mixed with other ingredients, make 15 carloads of BHC cotton dust. This quantity is sufficient to protect 12,000 acres of cotton plants, or 20 square miles, against the ravages of the boll weevil.

The average yield per acre of cotton is 250 pounds. However, even when the yield is as much as 700 pounds per acre, proper insect control through the use of BHC has been known to increase this to 1200 pounds per acre.

BHC dust costs \$10 or less per acre to apply, yet the grower can realize approximately \$100 in return.

*For further information, contact your nearest Columbia-Southern office.*

**COLUMBIA-SOUTHERN  
CHEMICAL CORPORATION**  
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY  
ONE GATEWAY CENTER • PITTSBURGH 22 • PENNSYLVANIA



DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland • Boston • New York • St. Louis • Minneapolis • New Orleans • Dallas • Houston • Pittsburgh  
Philadelphia • San Francisco

### Atlas Names Van Winkle

Atlas Powder Co. has named Dixon C. Van Winkle to manage its chemicals department's New York



D. C. VAN WINKLE

district sales office. Mr. Van Winkle succeeds L. G. Parkinson, who resigned recently.

Van Winkle joined Atlas in 1952 as a special sales assistant. Prior to coming with Atlas, he was with Velsicol Corp. and subsequently with Julius Hyman Co. as eastern manager.

### Plant Nutrients Up 2%

A recent issue of the National Fertilizer Association News reports that the total quantity of the three primary plant nutrients available for agricultural purposes in 1953-54 will exceed last year's supply by only about two per cent. Last November, USDA had estimated an increase of about 11 percent. '53 consumption of plant nutrients is now estimated at about 6.07 million tons . . . imports and exports are taken into account. Fertilizer sales in the United States for the year ending June 30, 1954, will be practically as great as in the previous year on a tonnage basis, and two to three per cent above '52-53 on a plant food basis.

### Evans, Diamond Chairman

The board of directors of Diamond Alkali Co., Cleveland, announced recently the election of Raymond F. Evans as chairman of the board, and J. A. Sargent as president

of the company. Messrs. Evans and Sargent were formerly president and executive vice-president, respectively.

### New PanAm Sulfur Plant

Pan American Sulphur Co., Dallas, plans to begin sulfur production in October, with the opening of a new plant at Vera Cruz, Mexico. The company estimates production capacity of the new plant, now being constructed, at about 400,000 to 600,000 tons a year.

### ODM Closes N Program

The Office of Defense Mobilization announced early in April that it was closing the defense expansion program for nitrogen. New plant capacity built, or planned, ODM said, will meet estimated wartime needs. A survey by the Commerce department shows that the capacity in existence or under construction is 2,881,000 tons, plus another 265,000 tons obtainable in by-product operation.



IT'S AS EASY TO MAKE  
A MINERALIZED FERTILIZER  
AS IT IS TO BAKE A Ready-Mix CAKE!

It's easy to make a cake with a prepared cake mix because the ingredients are already mixed for you. Making a mineralized fertilizer is just as simple because TC Mineral Mixtures come ready-mixed . . . carefully measured and mixed to your own specifications. There's actually just ONE ingredient to add to your present formula for a completely mineralized fertilizer.



Tennessee Corporation can supply custom-formulated mineral mixtures in controlled amounts of soluble and readily available forms of Copper, Manganese, Iron, Zinc, Magnesium, and Boron—in bulk or bags. Mineralize with a TC custom-mixed mineral mixture and cut down on multiple purchasing, raw material costs, labor, and handling.

Samples, Specifications and Detailed Information on Request.  
TENNESSEE CORPORATION

417-29 Grant Building, Atlanta, Georgia



*How Celite Mineral Fillers make a product free-flowing...*



## Keeping fertilizers "On the run"

REALIZING their product is one that cannot "cake-up" and still survive in a competitive market, leading producers of fertilizer use one of the Celite Mineral Fillers as a standard "anti-caking" ingredient.

The ability of Celite Fillers to keep a product free-flowing results from their

high absorption properties and unique diatom structure—properties which make them unusually effective safeguards against caking in deliquescent materials. They are two of the unusual physical characteristics that adapt these diatomaceous silica powders to numerous industrial uses.

### THESE CELITE PROPERTIES BENEFIT MANY TYPES OF PRODUCTS

Because of their inertness and great bulk per unit of weight, Celite Mineral Fillers make ideal bulking agents for powders and pastes. Their tiny multi-shaped particles interlace to stiffen and strengthen admixtures. The microscopically small facets of these particles diffuse light so effectively that they can be utilized to impart any desired degree of flatness to a surface film. Their light, porous nature improves suspension, helps prevent

segregation. And their porous, thin-walled cellular structure imparts a delicate non-scratching abrasive action.

You may find Celite the "extra something" needed to lift your product above competition. Why not discuss its application to your problem with a Celite engineer? Or write for further information and samples to Johns-Manville, Box 60, New York 16, N. Y. In Canada: 199 Bay St., Toronto, Ont.

### CHECK LIST OF PRODUCT BENEFITS OBTAINABLE AT LITTLE COST WITH CELITE MINERAL FILLERS

- Added Bulk
- Better Suspension
- Faster Cleaning Action
- Greater Absorption
- Improved Color
- Better Dielectric Properties
- More Durable Finish
- Increased Viscosity
- Elimination of Caking
- Higher Melting Point
- Better Dry Mixing
- Improved Dispersion



# Johns-Manville CELITE®

## MINERAL FILLERS

AGRICULTURAL CHEMICALS

## More Photos From NAC's Houston Convention



The photos on this page,—taken at the recent spring meeting of the National Agricultural Chemicals Association at Houston picture highlights of the barbecue held at the Whitcomb Ranch outside Houston. They come to us from the Houston Chamber of Commerce which group did a great deal to facilitate arrangements for the convention, and to help make conventioneers remember their first Texas convention.



Above—Tom Tennent of Ethyl Corporation, Houston, and August Petrus of Cotton States Chemical Co., West Monroe, La., who shared much of the responsibility for the barbecue as members of the Arrangements Committee.

Above right—Nancy Tennent and Gerry Whitcomb



Right center—E. H. Rappe, Swift & Co., Chicago, John Stoddard of Prentiss Drug and Chemical Co., New York, Mrs. Stoddard and L. G. Matthews, American Smelting & Refining Co.

Lower right—Paul Mayfield, Hercules Powder Co., Wilmington, president of NAC, Mrs. Whitcomb and her daughter, Gerry. Mrs. Whitcomb, on whose ranch the barbecue was held, was presented by Mr. Mayfield on behalf of the convention group with a bronze statuette of a Brahman bull.

# CALMONITE

AMMONIUM NITRATE LIMESTONE  
20.5% NITROGEN

#### 2 FERTILIZERS IN 1

Contains 10.25% quick-acting nitrate nitrogen.  
Contains 10.25% longer-lasting ammonia nitrogen.

#### GREEN PELLETS READY TO USE

Sized for flow and ease of application in broadcasting, top dressing, side dressing, and irrigation.  
Nonacid-forming.

#### ECONOMICAL SOURCE OF N

At low cost, Calmonite furnishes Nitrogen in the 2 forms needed by all plants—for rapid, early vigorous growth and sustained development.

#### SUPPLIES CALCIUM, TOO

Contains 35% to 40% calcium carbonate, secondary plant-food essential to soil productivity and good crop yields.

#### NOW AVAILABLE, F.O.B.

Regular Atlantic and Gulf ports, in even-weight, 6-ply paper bags with 2 bituminous liners.

#### LOOK AT CALMONITE!

Write for a sample and for additional information today.

Sole Distributors for  
RUHR-STICKSTOFF AKTIENGESELLSCHAFT  
Bochum, Germany

## H. J. BAKER & BRO.

established 1850

600 Fifth Ave., New York 20, N. Y.

#### Branch Offices:

Maryland Trust Bldg., Baltimore, Md.  
208 South LaSalle St., Chicago, Ill.  
Savannah Bank Bldg., Savannah, Ga.  
501 Jackson St., Tampa, Fla.

## 53-54 Fertilizer Analysis

THIS supplemental report reflects changes in the 1953-54 fertilizer supply estimates which were contained in the report issued in November, 1953 (Agricultural Chemicals, February, March, 1954).

The movement of fertilizer materials into trade channels was unusually slow during the period July, 1953 through January, 1954. The drop in fertilizer movement was reported to be more than 25 per cent in some areas with an estimated decrease of 12 per cent for the industry as a whole, as compared to the corresponding period the previous season.

This slow movement, in many instances, taxed storage capacity to the limit and production of certain materials was curtailed. A combination of several factors caused this condition. Included among them was the extended drought, which affected a great section of the country; also to be considered was the drop in farm income in 1953 and the uncertain outlook for 1954. There was a marked hesitancy on the part of some members of the trade—as well as users—to purchase in advance, since ample supplies were expected to be available and any favorable price change would work to their advantage. Improved equipment, which enables farmers to handle large volumes of material in a relatively short period of time, and changing distribution techniques are also influencing the seasonal movement of fertilizer materials.

Storage will continue to be a major problem that warrants further study and consideration.

Beginning in late February the situation gradually changed and by mid-March shipments in many areas exceeded the rate of movement in the spring of 1953.

It is generally felt that the over-all tonnage of fertilizer materials moved into trade channels in 1953-54 may be slightly below the 1952-53 tonnage, but the tonnage of plant nutrients used (due to more concentrated material) may exceed the 1952-53 all-time record. This forecast indicates that the trend toward high analysis material is continuing, and the tonnage of plant nutrients consumed—rather than that of total material—more accurately reflects fertilizer usage.

The over-all supply of the three primary plant nutrients will be ample to satisfy demand. As always there will be local shortages of specific materials and, due to the reluctance of users to order in advance of time needed, some may be unable to obtain exactly the kind of fertilizer material desired.

The supply of nitrogen (N) available for fertilizer purposes in 1953-54 is currently estimated to be 1.916 million tons. This estimate is based on July-January production, current rates of production, and probable contribution of synthetic ammonia facilities recently completed and those scheduled for completion during the remainder of the fiscal year.

## **Shows Slight Decline**

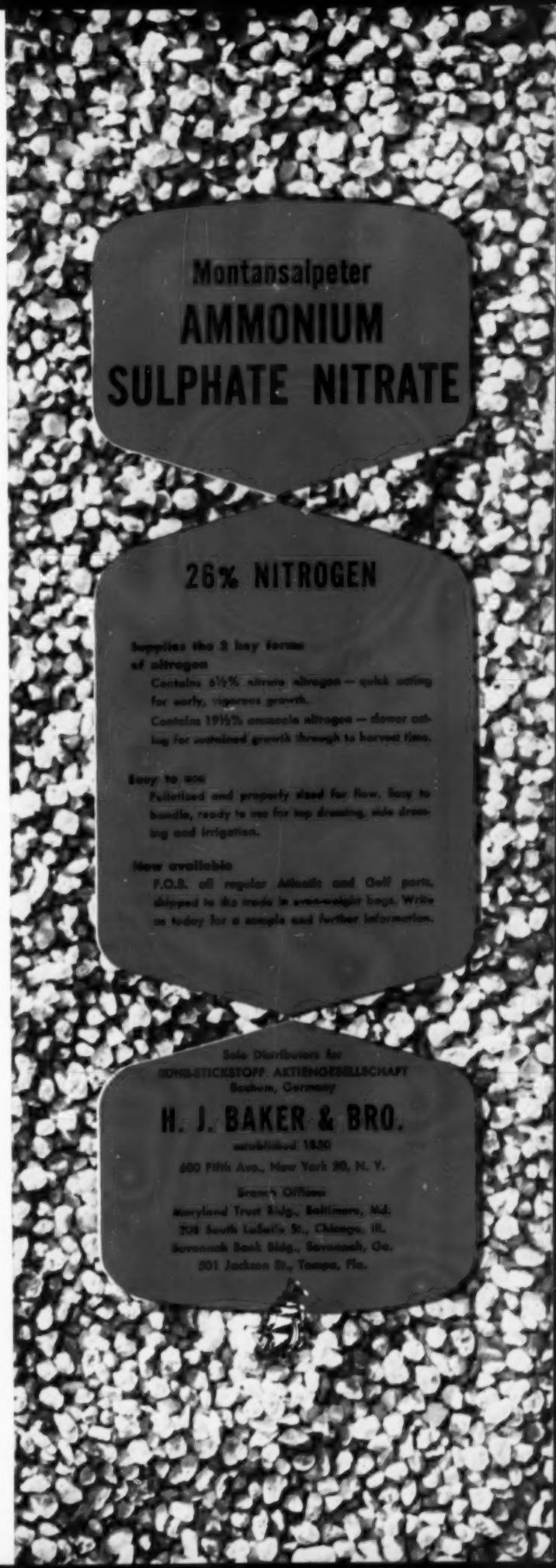
The revised 1953-54 estimated supply of phosphates in terms of available phosphoric oxide ( $P_2O_5$ ) is 2.325 million tons, representing a 12.8 per cent decrease from the earlier estimate and 3.7 per cent less than the 2.414 million tons reported as available in 1952-53.

The revised estimated 1953-54 supply of potash available for fertilizer in terms of potassium oxide ( $K_2O$ ) is 1.830 million tons. This represents a decrease of 4.4 per cent from earlier estimates, but is 5.2 per cent above the 52-53 supply.

Based on a Fertilizer Staff Report—Prepared by J. N. Lowe and  
C. A. Graham, Commodity Stabilization Service, Mobilization Activities  
Division, U. S. Department of Agriculture, Washington, D. C.

Table B. -- <b>PHOSPHATE</b> : Estimated 1958-59 Supply for Fertilizer Purposes United States and Possessions						Total by source	
Source	(In tons of 2,000 pounds available phosphoric oxide ( $P_2O_5$ ))						
	Mineral superphosphate	Concentrated superphosphate	Other 1/	Total by source			
U. S. Production	1,360,000 t/	960,000	120,000			2,330,000	
Imports		15,000	35,000	70,000		100,000	
Net supply, U. S. production	1,345,000	925,000	120,000			2,390,000	
Imports		1,000	1,000	2,000		4,000	
Total Supply -- U. S. and Possessions	1,346,000	926,000	120,000			2,396,000	
Percent Increase (or Decrease) of Net Supply, 1957 Estimate						+ 10.8	
Percent Increase (or Decrease) of 1957-58 Supply						- 5.7	

Table 5.—POTASH <sup>a</sup> : Estimated 1950-54 Supply for Fertilizer Purposes United States and Possessions							
(In tons of 2,000 pounds potassium oxide (K <sub>2</sub> O) content)							
Source	Allocation of potash <sup>b</sup>		Allocation of potash <sup>c</sup>		Allocation of potash <sup>d</sup>		Total Allocation by Source
	U.S. and territories	Other countries	U.S. and territories	Other countries	U.S. and territories	Other countries	
Deliveries from U. S. production	1,161,000	—	109,000	1,000	36,400	36,400	1,206,800
Imports	40,000	—	6,000	—	4,000	—	50,000
Net supply = U. S. production + <sup>e</sup>	1,197,000	—	115,000	1,000	40,400	36,400	1,253,800
Reserve	50,000	—	51,000	—	30,000	—	101,000
Total Supply = U. S. and Possessions	1,247,000	—	166,000	1,000	70,400	36,400	1,383,800
Percent Increase (or decrease) of 1950-51 estimate	—	—	—	—	—	—	—
Percent Increase (or decrease) of 1950-51 total	—	—	—	—	—	—	—





## The strength of our line is in the quality of our products *...may we serve you?*



To get highest-quality agricultural chemicals, quickly delivered from regional plants and warehouses, call on Wyandotte—a basic producer of raw-material chemicals for 64 years.

- DDT (technical)
- BHC (technical and high gamma)
- LINDANE (free flowing and readily formulated)
- KREELON\* (alkylarylsulfonate for fertilizers)
- WETTING AGENTS**
- SOLVENTS**
- FUMIGANTS**
- EMULSIFIERS**
- SOIL CONDITIONERS**
- PLURONICS\* (an amazing new series of surface-active agents and emulsifiers)

Wyandotte service-scientists are always available to give you skilled technical assistance on any processing or handling problem.

New product development, product improvement, and customer assistance, all of which directly benefit the people who buy our products, are some of the areas in which Wyandotte service-scientists work. Their aim is the most efficient, practical use of Wyandotte materials in your plant. Your problem can quickly become a research project, if the data is not already available in the store of information we have on your industry.

The advantage of the combination of up-to-the-minute research and quality chemicals shows up best where you like it most—in your profit. Send us your requests for information today. *Wyandotte Chemicals Corporation, Department AC2, Wyandotte, Michigan. Offices in principal cities.*

\*REG. U.S. PAT. OFF.



**Wyandotte**  
CHEMICALS

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA • CHLORINE • CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINATED SOLVENTS  
GLYCOLS • SYNTHETIC DETERGENTS • AGRICULTURAL INSECTICIDES • SOIL CONDITIONERS • OTHER ORGANIC AND INORGANIC CHEMICALS



H. A. KENNINGTON

#### Raymond Names Kennington

Raymond Bag Co., Middletown, Ohio, manufacturers of multiwall paper shipping sacks, announced last month the appointment of Henry A. Kennington as general sales manager. Prior to joining Raymond, he served as sales manager for one of the industrial divisions of Armour & Co.

#### Insect Losses Reviewed

Local insect problems in the north central states, and suggested control methods are reviewed in the spring newsletter of Hobough & Marvin, Manhattan, Kansas. Their summary is based on reports from the recent March meeting in Omaha of the North Central branch of ESA.

It is reported that 16,000 acres of corn were destroyed by wireworm in Iowa, in 1953, and 10,000 acres had to be replanted because of cutworms. 85,000 acres were treated for rootworms, wireworms, etc.

Successful control of army cutworms in wheat may be obtained, it is suggested, with applications of dieldrin at 6 oz. per acre, or toxaphene at 2 lbs. per acre. Airplane applications of these toxicants in two gallons of diesel fuel have given favorable results in Colorado. It is pointed out that in control applications for cutworms, which feed under the ground, the insecticide must be either harrowed into the ground, washed in with rain, or liberal amounts of water (13 gallons, or so), must be used to assure effective control.

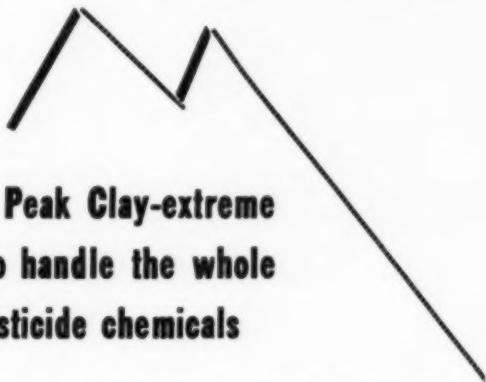
The bulletin also comments on granular pesticides, pointing out that although this form of product is not likely to replace liquids or dusts, for general use, it is suited for specific control measures. Granular insecticides will fall into the whorl of a corn plant and so be more effective in controlling fall armyworms feeding in the whorl. The granular product drops readily rather than drifting, and can be used with airplane dusters or specialized ground equipment.

#### AmerAg "Phosphodust" Data

A "seven-point" data sheet dealing with the use of "Phosphodust," a product of American Agricultural Chemical Co., New York, lists the properties of this diluent in insecticide dusts. It is said to formulate readily with toxaphene, parathion, TEPP, carbamate fungicides, DDT and BHC. It is reported to be free-flowing, non-abrasive, and about neutral (pH 6.9-7.2).

Now, a BETTER carrier and diluent

## Pike's Peak<sup>®</sup> ABSORBENT CLAY

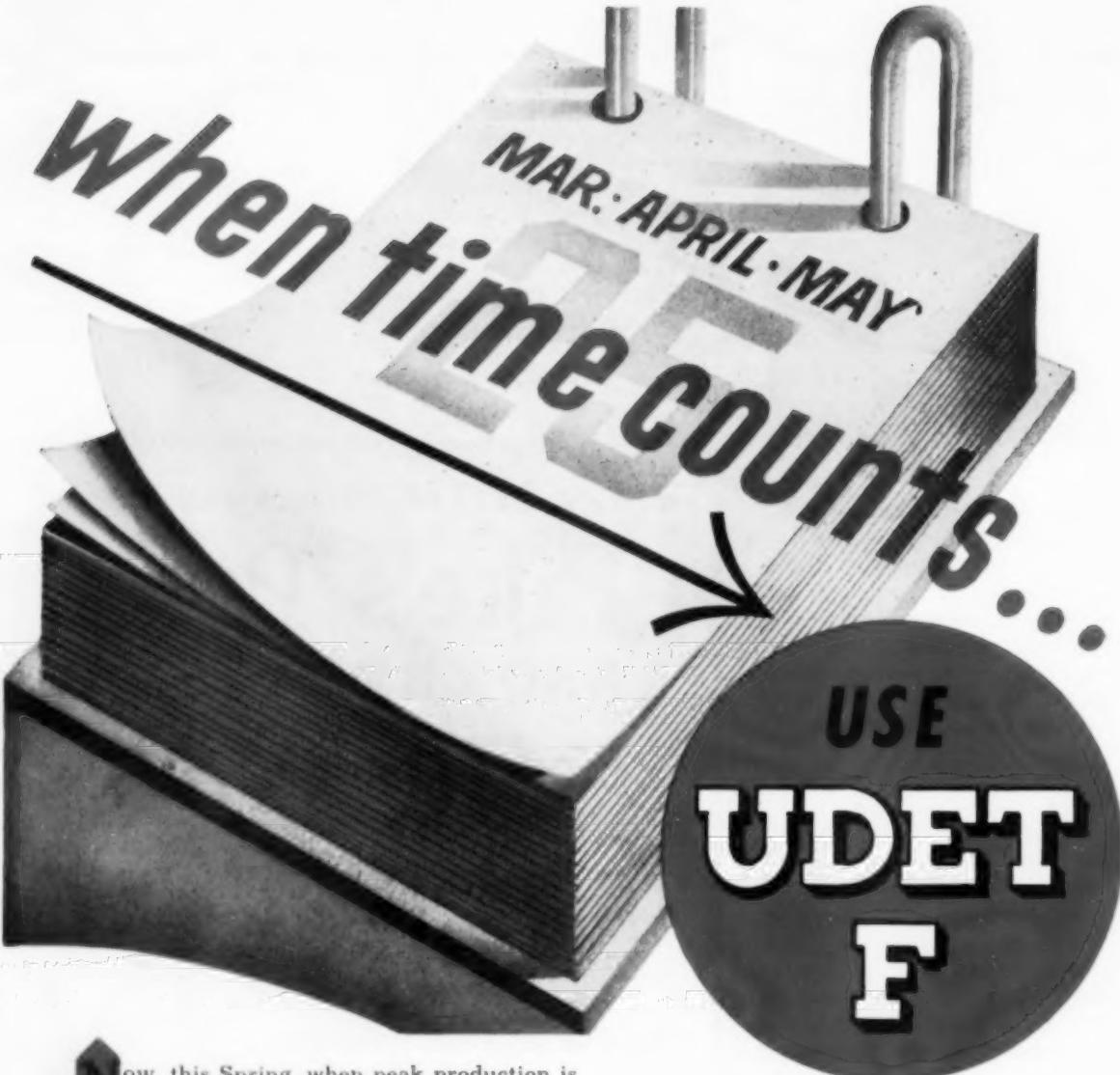


Try Pike's Peak Clay—extreme  
flexibility to handle the whole  
range of pesticide chemicals

- ★ High degree of absorbency—for grinding and impregnating all toxicants such as DDT, BHC, Toxaphene, Aldrin, Malathion, Parathion, Chlordane and many others.
- ★ Extremely fine particle size—has a high degree of flowability before and after impregnation.
- ★ Uniformly low moisture and pH of approximately 5—assure you of complete compatibility with a wide range of toxicants.
- ★ Standard grind guaranteed 95% through 325 mesh.—Also available in a variety of particle sizes to meet your specifications.

Try Pike's Peak Clay in your operation. You save . . . not only in ton prices, but in production speed-ups. A generous free sample will be sent upon request for your evaluation.

**GENERAL REDUCTION COMPANY**  
1820 ROSCOE STREET CHICAGO 13, ILLINOIS



**N**ow, this Spring, when peak production is your goal, use UDET F and get: Faster curing. Easier handling of materials. Faster milling and screening. Minimum "down" time.

Maintain maximum production. And deliver a fully-cured product, practically free from caking, for continued customer satisfaction.

Use UDET F, the one surfactant proved by fertilizer makers in conclusive tests!

**UDET 95F** — a 95% active granular powder

**UDET 50F** — a 50% active free-flowing liquid

IN ACIDULATION, UDET F is up to 3-times more effective than competing products in the presence of calcium ions.

IN AMMONIATION, UDET F, being instantly soluble, disperses completely in the mix. Permits higher absorption of ammonia.

IN GRANULATION, UDET F inhibits cake build-up and equipment fouling. Increases production through less "down" time.

IN AMMONIUM SULFATE PRODUCTION, UDET F lowers moisture content. Provides anti-caking properties.

STOCKS AVAILABLE AT LOCAL WAREHOUSES

**UNIVERSAL DETERGENTS, INC.**  
1625 East Spring Street, Long Beach 6, California

Eastern Distributors:  
**PHILIPP BROTHERS  
CHEMICALS, INC.**  
37 Wall Street  
New York 17, New York

Midwestern Distributors:  
**THOMPSON-HAYWARD  
CHEMICAL CO.**  
18 Branch Offices  
Headquarters: Kansas City, Mo.



Division, PETROCHEMICALS CO.  
Danciger Building, Ft. Worth, Texas  
Eastern Sales Office: Graybar Bldg.  
420 Lexington Ave., New York 17, N.Y.

### Toxicology Expert Dies

Dr. Herman A. Shelanski, 42, president and director of the Industrial Toxicology Laboratories, Inc., Philadelphia died recently at his home there. In addition to his work at the Laboratories, Dr. Shelanski was a special consultant to Hercules Powder Co., Texas Co., and other industrial concerns.

### New Pennsalt Divisions

Two new operating divisions have been set up by Pennsylvania Salt Manufacturing Co. to provide a more logical product grouping. The new units also will provide better customer service and a suitable pattern of organization for expected future growth, according to George B. Betzel, president.

The divisions will handle industrial chemicals and chemical specialties and will function as complete operating units responsible for both the manufacture and sale of their respective products.

William P. Drake, vice president in charge of sales was named president of the Industrial Chemicals division; Albert H. Clem, general sales manager, is president of the Chemical Specialties division and William F. Mitchell, formerly head of Pennsalt's manufacturing activities, becomes vice president in charge of engineering, purchasing and traffic.

### Phillipines Buy Rodenticide

Monsanto Chemical Co., St. Louis, recently shipped 500 pounds of Compound 1080, to Mindanao, Phillipine Islands, to combat brown rats which have swept over a large part of the island, destroying rice and corn crops.

### TVA to Cut '55 Fertilizer

1955 production of fertilizer by the Tennessee Valley Authority will be somewhat below the current year's output, according to information supplied the House Appropriations Committee. The reduction in production reflects the plans to sell a larger part of the plant's output in the form of intermediate products.

TVA presently produces four fertilizers in demonstration-scale

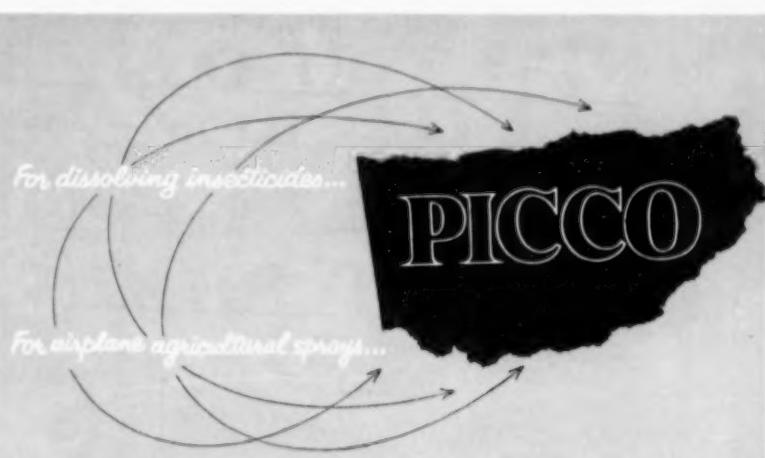
plants: concentrated superphosphate, calcium metaphosphate, fused tricalcium phosphate and ammonium nitrate.

### Aldrin Seed Treatment OKed

Shell Chemical Corp., New York, announced last month that the USDA has granted label acceptance for the use of aldrin in seed treatment. The compound can now be used in chemical treatment of corn and small grain.

### Insecticide Act Interpreted

The Agricultural Research Service of the Department of Agriculture recently issued interpretation No. 20, covering the intent of the Federal Insecticide, Fungicide and Rodenticide Act, and the Food, Drugs and Cosmetics Act. The interpretation is intended to cover new combinations of products now being placed on the market to be used in agriculture for controlling weeds in food crops.



*offers a complete line of  
high quality, dependably uniform*

## SOLVENTS *and* SOLVENT OILS

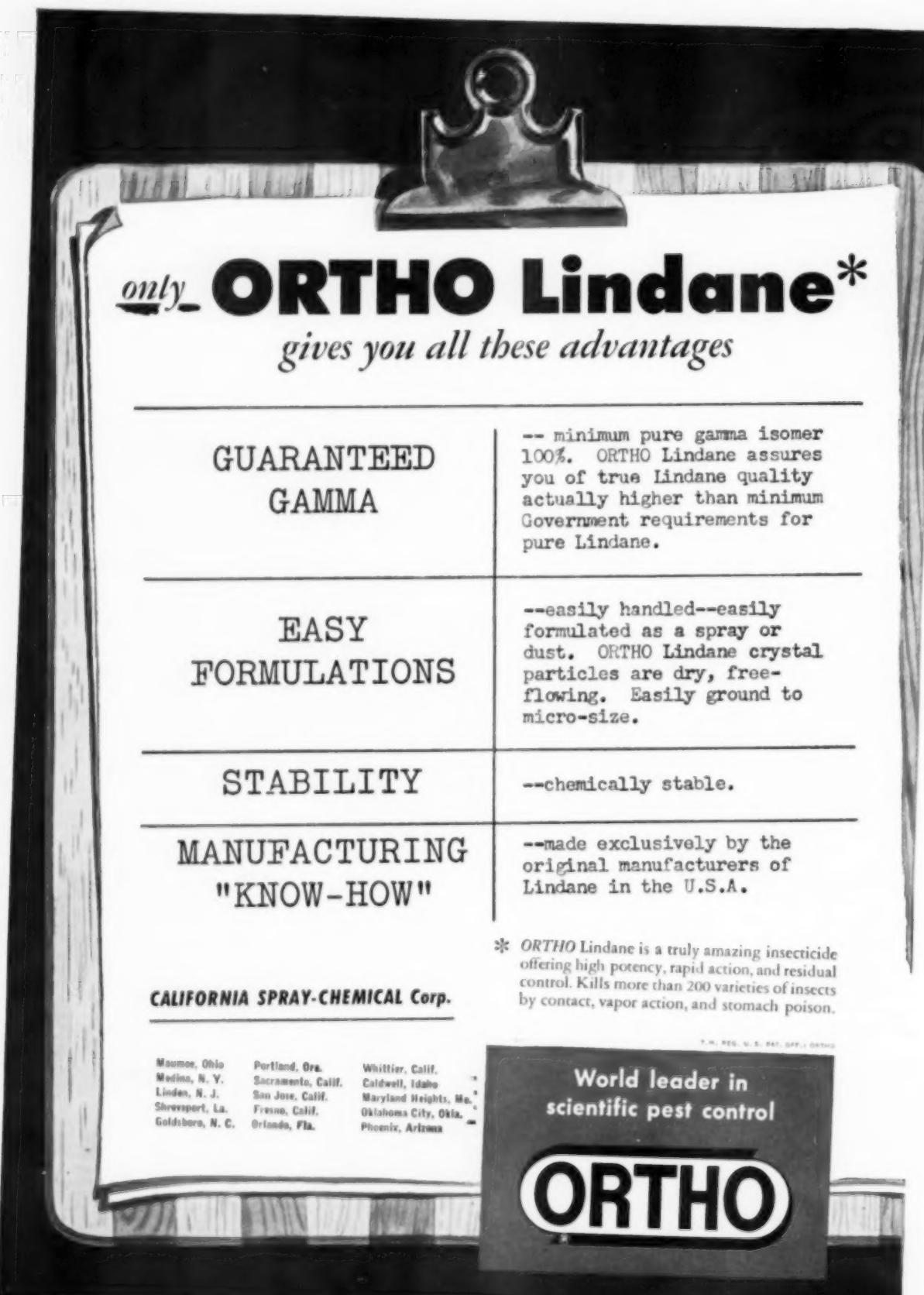
PICCO Coal Tar Aromatic Solvents are available in a complete series of grades, from low to high boiling points, each grade being carefully fractionated to closely maintain specifications.

Complete data on all grades, and samples for testing, will be sent upon request. Please specify application.



PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.  
CLAIRTON, PENNSYLVANIA

Plants at Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.



# only **ORTHO Lindane\***

*gives you all these advantages*

---

## GUARANTEED GAMMA

---

-- minimum pure gamma isomer 100%. ORTHO Lindane assures you of true Lindane quality actually higher than minimum Government requirements for pure Lindane.

## EASY FORMULATIONS

---

--easily handled--easily formulated as a spray or dust. ORTHO Lindane crystal particles are dry, free-flowing. Easily ground to micro-size.

## STABILITY

---

--chemically stable.

## MANUFACTURING "KNOW-HOW"

---

--made exclusively by the original manufacturers of Lindane in the U.S.A.

\* ORTHO Lindane is a truly amazing insecticide offering high potency, rapid action, and residual control. Kills more than 200 varieties of insects by contact, vapor action, and stomach poison.

**CALIFORNIA SPRAY-CHEMICAL Corp.**

Maurice, Ohio  
Medina, N. Y.  
Linden, N. J.  
Shreveport, La.  
Goldsboro, N. C.

Portland, Ore.  
Sacramento, Calif.  
San Jose, Calif.  
Fresno, Calif.  
Orlando, Fla.

Whittier, Calif.  
Caldwell, Idaho  
Maryland Heights, Mo.  
Oklahoma City, Okla.  
Phoenix, Arizona

World leader in  
scientific pest control

**ORTHO**



#### Demonstrate TVA Mixer

Guaranty Seed Co., Bunkie, La., plan a demonstration for fertilizer manufacturers of their application of the TVA funnel-mixer (above) to the manufacture of superphosphate. The demonstration is scheduled for June 1, 1954 at Bunkie.

#### Hercules Leases NH<sub>3</sub> Plant

Hercules Powder Co., Wilmington, announced in mid-April, that it will lease the government-owned Missouri Ordnance Works for \$3,625,000, for the production of anhydrous ammonia. The works consist of three high pressure anhydrous ammonia lines, using natural gas as a raw material, having a capacity of approximately 42,000 tons of ammonia annually. Production is expected to begin within three months.

The Missouri Ordnance Works was built in 1941-1942 by Hercules for the U. S. Army Ordnance Department in World War II, and originally included five complete anhydrous ammonia lines. Two of these lines later were dismantled and set up at San Jacinto, Tex.

Hercules announced plans for a joint undertaking of the plant with the Alabama By-Products Corp. for the production of 45,000 tons of anhydrous ammonia at Birmingham.

#### Mozer Back in Business

Philip C. Mozer recently purchased the stock of the Export Chemical Corporation of Colorado from the referee charged with disposing of the assets of the bankrupt Chemical

Corporation of Colorado, Denver. The export corporation was a separate company formed in 1950 by Chemical Corporation of Colorado, its operations at that time being confined exclusively to the export field.

With the original parent company no longer in business, Mr. Mozer will expand operations of the export company in the domestic as well as the export field. Manufacturing operations are being started again in a re-equipped plant in Denver; a herbi-

cide and insecticide plant has also been installed in the Puerto Rico branch of the company.

#### F&B Fertilizer Booklet

Faesy & Besthoff, Inc., New York, have recently issued a new booklet on their complete line of fertilizers, plant foods for lawns, vegetables, flowers, trees and shrubs. Contained are descriptions and recommended uses for the F & B products.

## HERE THEY ARE! THE NEW FLINT NH<sub>3</sub> TANKS



### FLINT TANKS ARE EASIER TO SELL BECAUSE THEY'RE EASIER TO USE!

New, time-saving FLINT Anhydrous Ammonia TANKS will make a hit with every customer and put more money in your pocket! When using a FLINT TANK to apply anhydrous, your customer will have fewer stops for refilling thus more productive time can be spent in the field. Why? Because 85% of a FLINT TANK's total liquid capacity is usable! Before shipping, each FLINT NH<sub>3</sub> TANK is checked by a National Board Inspector to insure careful welding and the use of only highest quality steel plate. FLINT's standards of longer, more rugged service is thus maintained. Tanks are completely weather-proofed and inspected to meet every state safety regulation and code for 250± psi working pressures. Shipped dry and complete with NH<sub>3</sub> pressure gauge; positive hand shutoff valves on vapor filler and liquid outlet.

### NEW easier-to-use fittings

Open, easily reached fittings for finger-tip pressure control.  
Protected from damage by Flint's distinctive red combing.

APPLICATOR TANKS	FARM SERVICE TANKS	BULK STORAGE TANK
100 gal. 157 gal.	500 gal. 1000 gal.	6000 gal.
200 gal. 236 gal.	in 28" - 41" and 46" diameter	18,000 gal.
318 gal. 500 gal.	38,000 gal.	



## FLINT STEEL CORPORATION

MEMPHIS, TENNESSEE

P. O. Box 3155

Phone 9-3558

## Only 2 Emulsifiers needed to Emulsify 22 Toxicants!



TRITON X-150 and TRITON X-160, when used alone or in combination with each other, will economically emulsify toxicant-solvent systems of the various pesticides listed here. These efficient emulsifiers give top field performance and they are effective in hard or soft waters.

Formulators will find that TRITON X-150 and TRITON X-160 can easily replace the assortment of emulsifiers usually required to emulsify the many pesticides in use today. The advantage of operating with a minimum emulsifier inventory and the low levels of TRITON X-150 and TRITON X-160 required for good toxicant emulsions offer extra savings to the formulator.

Write or call the nearest Rohm & Haas office for complete technical information.

### Toxicants emulsified by TRITON X-150 and TRITON X-160.

Aldrin	Dieldrin	Nitrox 80**
Aramite*	Endrin	Parathion
BHC	Heptachlor	Rhothane
BHC-DDT	Lindane	Toxaphene
Chlordane	Malathion	Toxaphene-DDT
DDT	Methoxychlor	
Butoxy ethoxy propanol Ester of 2,4,5-T		
Butyl Esters of 2,4-D and 2,4,5-T		
Chloro-IPC		
Iso-octyl Esters of 2,4-D and 2,4,5-T		
Isopropyl Esters of 2,4-D and 2,4,5-T		

TRITON and RHOthane are trademarks, Reg.  
U. S. Pat. Off. and in principal foreign countries.

\*Registered trademark of U.S. Rubber Company  
\*\*Chemagro Corporation

 CHEMICALS FOR INDUSTRY

**ROHM & HAAS  
COMPANY**

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

### To Probe Potash "Dumping"

An investigation into potash shipments from East Germany into the United States has been ordered by Secretary of the Treasury Humphrey to see if American potash producers are being injured by sales at "less than fair value." The investigation will be made under provisions of the Anti-Dumping Act of 1921, the aim of which is to prevent foreign producers from selling their goods in the U. S. at prices which would undercut and damage domestic industry.

The complaint of the American producers notes that East Germany is selling potash in the U. S. at \$24 a ton, plus freight, while they are charging \$30.60 a ton in Denmark and \$39 in England. If the findings indicate that U. S. industry is being injured, or likely to be injured, the Secretary of the Treasury can direct the Customs Bureau to increase the duty on incoming shipments to bring the foreign price into line with U. S. prices.

The six American producers of potash complain that availability of cut-price East German potash is slowing domestic buying, and that the industry is being hard hit because it is unable, because of the delayed buying, to plan its production schedules for the year.

### New Arkansas Lab.

A new soil testing and research laboratory, under construction at Marianna, Ark., will be dedicated June 10 with speeches by agricultural leaders, including J. Earl Coke, assistant secretary of agriculture.

The laboratory will be a branch of the main soil testing laboratory at Fayetteville, and will be used to analyze all samples submitted from counties in eastern Arkansas. The branch will enable an expansion of fertilizer research by the agronomy department of the College of Agriculture.

### Talley Heads Ammonia Works

Named manager of Hercules Powder Co.'s new Missouri ammonia works at Louisiana, Mo., last month was Joseph B. Talley. Named to

assist him was Frank E. DeVry.

The company has announced plans to make anhydrous ammonia at the Missouri Ordnance Works, which it leased in April to set up the plant. The ammonia which will be in production in three months, will go to industry and agriculture.

Mr. Talley had been works manager at Bacchus, Utah, since June, 1952, and had served in supervisory capacities at Hercules plants in Bessemer, Ala., Hercules, Cal., Kenvil, N. J. and Ishpeming, Mich. Mr. DeVry has been acid department supervisor since April, 1951, at the company's Hercules, Cal. plant. He joined the company in 1942.

### Diazinon for Fly Control

Approval of the new insecticide diazinon for fly control has been granted Geigy Agricultural Chemicals, New York. The company says its phosphate insecticide is available for commercial use in the 25 per cent wettable powder form and as a one per cent bait. Geigy says diazinon was "unanimously accepted as the best experimental material in 1953."

The material was first tested in the Rhone Valley in Switzerland and in the United States during 1952 with outstanding results. One of the big advantages of the new insecticide, according to Geigy, is its control of house flies resistant to chlorinated hydrocarbons. It is intended for non-dairy barns, sheds and poultry houses. In further tests being conducted by the company, diazinon is providing promising results against a number of crop pests.

### Dealer Spray Kit

Spray and dust merchandising kits are being sent to pesticide dealers all over the country as part of an educational program to help them sell more pesticides, sprayers and dusters. Sponsoring the program is the Inter-Association Council of Pesticide and Applicator Manufacturers. The kits are being distributed by agricultural chemical manufacturers participating in the 1954 promotional program.

A poster, which emphasizes the

theme, "It Pays to Spray and Dust for Health-Comfort-Profit," is included in the kits. The poster was reproduced on the cover of the March Agricultural Chemicals.

### German Fertilizer Exports Up

Exports of nitrate fertilizer climbed higher last year in West Germany, with shipments to the United States more than doubled. The United States purchased nearly DM 54 million worth of German nitrate fertilizer in 1953, more than twice as much as in 1952.

### Plant Path. Leader Dies

A pioneer in plant pathology, Dr. Frederick De Forest Heald, died last month at the age of 81. Dr. Heald joined the faculty of Washington State College in 1915 and had been head of the plant pathology department for 24 years. Author of many books and articles in the field, Dr. Heald had been associate editor of "Phytopathology" for nine years.

### Note of Correction

The article on "Radiotracers in the Study of Systemic Insecticides," appearing in the March issue of *Agricultural Chemicals* did not give full credit to all of the authors of this research study: R. B. March, T. R. Fukuto and R. L. Metcalf. Our apologies for this oversight.

### New Emulsol Bulletin

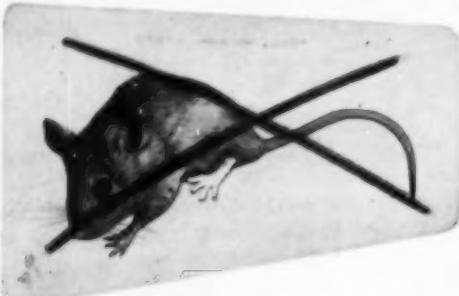
Twelve pesticide formulations, involving nine pesticides are described in a new bulletin published by Emulsol Corp., Chicago. The bulletin gives technical information on the company's versatile toxicant emulsifiers Emcol H-85A. Copies may be obtained from the corporation, at 59 East Madison St., Chicago.

### Baughman Appoints Miller

John A. Miller has been appointed sales engineer for Baughman Mfg. Co., Jerseyville, Ill., and will handle the complete line of Baughman conveyors, bulk transport bodies and bulk feed bodies. His offices will be located in Atlanta, Ga.

# What's new in Naugatuck \*

**PHYGON®**  
promises  
more  
benefits—as rodent repellent...  
mint fungicide



As a seed protectant, Phygon has delivered many marketable benefits to growers of alfalfa, beets, corn, peas, pepper, rice, sorghum, spinach, swiss chard, tomatoes. Now, according to U.S. Fish and Wildlife Service, stored Phygon-treated seed has mouse-resistant properties.

As a fungicide, Phygon-XL has proved equally successful in improving such crops as apples, peaches, cherries, tomatoes as well as many ornamentals. Now it has solved a long-standing peppermint oil problem by providing excellent control of mint rust *without leaving undesirable residue in the oil extract.*

Naugatuck is proud of these two new additions made to Phygon's remarkably versatile list of accomplishments.

\* One in a series of advertisements demonstrating Naugatuck's continuing effort to introduce new and better products for agricultural and related uses.



## Naugatuck Chemical

Division of United States Rubber Company  
ELM STREET, NAUGATUCK, CONNECTICUT

producers of seed protectants, fungicides, miticides, insecticides, growth retardants, herbicides: Spergon, Phygon, Aramite, Synklor, MH, Alanap.

### Texas Sets '55 Dates

Tentative dates for the second annual Texas Agricultural Chemical Conference have been set for February 2 and 3, 1955, at the Student Union Building, Texas Tech, Lubbock. Herbicides, fertilizers and insecticides will head the list of conference topics.

### CSMA Meets May 24-25

New toxicants, product damage by insecticides, toxicity, etc., are featured subjects scheduled for the insecticide division sessions of the Chemical Specialties Manufacturers Association spring meeting, to be held at the Netherland Plaza Hotel, Cincinnati, May 24-25. The following reports will be given:

"Product Damage Hazards with Insecticides," by Dr. R. E. Heal, National Pest Control Assn., New York; "X-Disease in Cattle" by Dr. A. M. Lee, Bureau of Animal Industry, U.S. Dept. of Agriculture, Washington, D. C.; "What Has Happened to the Insecticide Business — 1948-1953," by Ira P. MacNair, publisher of *Soap & Sanitary Chemicals*; "A New Insecticide Toxicant" by H. L. Haynes, Carbide & Carbon Chem. Co., N. Y.

"Household Insects," by George C. Decker, Urbana, Ill.; "Insecticide Survey of 1953," by Dr. George W. Fiero, Esso Standard Oil Co., New York; "DDT Toxicity Up to Date," by Dr. Albert Princi, University of Cincinnati; "Anti-coagulant Formulations for Rodent Control," by Walter Dykstra, Fish and Wildlife Service, Washington, D. C.

### Bollworm Area Extended

Arkansas is to be added to the States quarantined because of the pink bollworm of cotton, the U. S. D. A. announced recently. Under the quarantine, the movement of lint, linters, cottonseed, cotton products, and other articles from the lightly infested Arkansas counties of Columbia, Hempstead, Howard, Lafayette, Little River, Miller, Nevada, and Sevier will be regulated. The action, effective April 1, comes as a result of a public hearing at Memphis, Tenn., on January 14, by USDA's Agricultural Research Service.

NEWS

*Brevities*

RUTGERS UNIVERSITY has completed plans for its annual Aggies' Field Day. The event was to be held May 8 at the College Farm.

DR. BERNARD RUDNER has joined the Research and Development staff of Davison Chemical Corp. and is located at Hilltop Research Laboratories in Baltimore. Dr. Rudner served with General Aniline and Film Corp. before joining Davison.

A ONE MILLION DOLLAR expansion program at the Alberta nitrogen department of the Consolidated Mining and Smelting Co. of Canada has been started, the company reports. The enlarged plant at Calgary, Alberta, will boost fertilizer output by more than 50,000 tons a year.

COMMON SALT can be substituted for one-fourth of potash in fertilizers for potassium-deficient Mississippi soils. That statement was made to members of the salt industry last month by Dr. C. Dale Hoover, Mississippi State College, on the basis of cotton response to sodium.

PHILLIP BROTHERS CHEMICALS, Inc., has been appointed sales agent for I. P. Thomas & Son Co., Camden, N. J., for the sale of triple superphosphate. K. D. Morrison, of Phillip Brothers, will direct the program.

W. J. RAY, assistant sales manager of the Indianapolis Sales Division, Bemis Bro. Bag Co., was transferred in April to the company's general offices in St. Louis, where he is

assisting S. M. Spencer, supervisor of textile bag sales.

A CHARTER for Oklahoma Liquid Fertilizer Corp., El Reno, Okla., has been granted by the state. Authorized capital stock is \$25,000.

TRI-STATE CHEMICAL CO. is building a \$133,000 fertilizer plant in Henderson, Ky., with a capacity of 20,000 tons a year.

INSECTICIDE fumigators will be manufactured by a newly incorporated firm, Lehigh Chemical Co., of Louisville.

NEW AGRONOMIST for Nitrogen Division, Allied Chemical & Dye Corp., is Howard R. Lathrop, who will work in the Midwest, the company reports.

LEWIS M. LUDLOW has been named field representative for the Pacific district office, M.A. Division, Wyandotte Chemicals Corp.

PAUL K. MCKINNEY and D. Leon Williams last month figured in personnel changes at Union Bag and Paper Corp. Mr. McKinney, sales representative, has been transferred from Houston to Kansas City, while Mr. Williams has been shifted from New York to Texas.

A CHARTER to deal in insecticides has been granted Cherry Chemical Co., of Cherryville, N. C.

J. P. WIDLAR, formerly sales manager of the Kansas City branch of Chase Bag Co., has been appointed to the company's Paper Bag Division.

NOW ASSISTING Howard F. Roderrick, vice president of the Phosphate Chemicals Division of International Minerals & Chemical Corp., is H. W. Dahlberg, Jr., who joined the company in 1945.

ED DOBBIN, proprietor of Edco Corp., Elkton, Md., and normally a "regular" at NAC conventions, was among those missing at Houston in March. It's all clear now, — and he can be marked "excused," for a card arrived a few weeks ago from Sao Paulo, Brazil. But, Ed, the insecticide season should be over this time of year down Brazil way!

STAUFFER CHEMICAL CO., recently issued the first public year-end report of the activities of the company in its 69 years. The report follows broadening of ownership of the company from about 60 shareholders to nearly 3,000.

H. M. ARMITAGE, chief of the Bureau of Entomology, State Department of Agriculture, California, has been named chairman of a committee to organize state observances of the Entomology Centennial in California.

DR. A. J. DIRKSEN has been named director of sales development for American Potash & Chemical Corp.

"NEARLY ALL ANIMALS in a herd are likely to be parasitized . . . there is no sharp contrast between sick and well to catch the eye." That is the comment of Dr. D. C. Boughton, concerning hog roundworms made before the annual meeting of Livestock Conservation, Inc., in Chicago. Dr. Boughton described the damage caused to swine by the parasite and discussed chemical control measures.

## APFC TO HOMESTEAD

(From Page 59)

Nacogdoches, Texas; Ladies', Mrs. John W. Hall, Chevy Chase, Md.; Golf, Dean Gidney, New York City; Ladies' Golf, Mrs. Ed Kolb, Ridgewood, N. J.

Winners of the "Soil Builders Award for Editors" contest sponsored by the council, will be honored on June 11. Louis H. Wilson, secretary will make the presentations to Paul

D. Sanders of *Southern Planter*, and Robert H. Reed of *Country Gentleman*.

The "Soil Builders Award for Editors" contest was conceived and planned in cooperation with the American Agricultural Editors' Association for the purpose of recognizing both editors and their staff members "who have rendered outstanding service as soil builders and, as such, builders of a more sound and profitable farming system." ★★

Triangle Brand Copper Sulphate has been recognized as an effective agricultural chemical for more than sixty years. In sprays (where Bordeaux mixtures are the most reliable), in dusts (if you prefer them) and in fertilizers (for additional enrichment of the soil) Triangle Brand Copper Sulphate has proved itself worthy and dependable. Try these Triangle Brand forms of Copper Sulphate:

INSTANT (powder) for quick and efficient mixing of Bordeaux sprays.  
SUPERFINE (snow), SMALL or LARGE CRYSTALS, all containing 25.2% metallic copper.

BASIC Copper Sulphate in powder form, containing 53% metallic copper.  
*Write for booklets that will help you solve your agricultural problems.*

**Control POND SCUM and ALGAE with Triangle Brand Copper Sulphate. Write today for information on how it can help you maintain healthy water conditions.**

**PHELPS DODGE REFINING CORP.**  
40 WALL ST., NEW YORK 5, N.Y. • 330 N. MICHIGAN AVE., CHICAGO, ILL.



## AIKEN BILL STUDY

(From Page 33)

of actual use—warning them to follow recommended precautions, and to make use of essential safety measures.

Let's not make the mistake of feeling that, once we have a law, we can all relax. Continued day-in-and-day-out vigilance is imperative if we are to guard most effectively against those tragic errors that can and always will occur.

## CALIFORNIA FERTILIZER

(From Page 47)

was incorporated, operating thereafter as the Mid-State Chemical Supply Company.

Early in 1953 Houston's health made it advisable for him to discontinue active business, and he offered the fertilizer business to Cal-Spray. Negotiations were then completed and Cal-Spray purchased all the equipment and inventory, and all of the real estate except that in Lindsay. This remains the property of the Houstons, and on it Cal-Spray took a long term lease. Les R. Hamilton, who had been operations manager under Houston's direction, became affiliated with Cal-Spray as supervisor of fertilizer sales.

Principal officers of Cal-Spray are Arthur W. Mohr, president; E. W. Cannon, vice-president and manager of the marketing department; and C. E. Cody, western manager, marketing department. Its 42 plants, scattered from Portland, Oregon to Puerto Rico, turn out 548 products for consumption in the major agricultural areas of the United States and the civilized world. The position of prestige and leadership which it holds in the industry today has been built up since it was founded in 1907 by E. E. Luther and W. H. Volck, who started manufacturing operations in Watsonville, California in 1908, supplying insecticides and oil sprays for California's fruit growers.

The Orange Belt Supply Co., of which A. R. Wakefield is president, Raleigh Black is secretary-treasurer, and Bruce Graves is general

manager, contains a dry mixing unit of 1,500 tons capacity. Fertilizers and a complete line of insecticides are sold to the farmers of Tulare county. The concern also operates a retail farm supply store, and is agent for Douglas petroleum products for Tulare county.

John Parker, manager of the Fresno Agricultural Chemical Co., Fresno, reports that the company uses a Sturtevant dry mixing plant, which has a daily capacity of 100 tons, equipped with a St. Regis valve bag packer. "Red Top" brand fertilizers and pesticides are manufactured here for distribution through dealers all over northern California. There is a Raymond 5-roller, high side sulfur mill used for processing sulfur and other products for agricultural use. A dehydrator is available, for production of livestock feed from grape pomace.

Sunland Industries, Inc., Fresno, was originated in 1925 under the name California Associated Buyers Co., which sold supplies to the farmers of the area. Beverly H. Jones, who still heads the company, and T. L. Harper were partners. In 1930 a sulfur mill was installed, and the Sunland Sulfur Co., Inc. was organized. In 1932 the manufacture of insecticides was begun, and today represents a large phase of Sunland's sales volume.

In 1934 a simple fertilizer line was added to further serve agriculture in the area. This new branch of the business grew rapidly, and in 1937 a new plant was built for mixing commercial fertilizers tailored to local needs. More recently, a new electronically controlled dry mixing plant has been placed in operation, with a daily capacity of 240 tons. There is also a new plant for ammoniating superphosphate. A complete liquid fertilizer mixing plant is in operation, as is a unit for converting anhydrous ammonia to aqua ammonia.

In 1939, a plant was built to clean and process field and cover crop seeds. Thus, in order of their development, Sunland has four major departments: sulfur, insecticides, fer-

tilizer and seeds. Today, Mr. B. Jones carries on as president, Frank Easton is general manager, Dr. Guy MacLeod is technical vice-president, Ed Cunliff is sales manager, and Alden C. Carey is manager of the fertilizer department. Warehouses are maintained in Bakersfield, Porterville, Modesto, Sacramento and San Jose, which, with dealers and distributors, cover the San Joaquin, Sacramento and Santa Clara Valleys.

Modern-Ag Crop Service, Fres-

no, is a partnership venture of Alden V. and Clarence E. Jenan of Visalia. They also own and operate the Linda Loma Ranch near Visalia. Operating personnel of Modern-Ag Crop Service includes H. D. Stephenson, general manager, and William F. Knorr, chief chemist. The plant is equipped for mixing liquid fertilizers, which are packaged and distributed in barrels. Also sold to the farmers of the area are dry fertilizers, soil amendments, pesticides, defoliants and seeds.

## FERTILIZER SELLS BETTER

With a  
"NEW LEADER"  
MOTOR DRIVEN  
SPREADER



and  
WE WANT TO PROVE IT!

A good spreading service — owned by the company, a dealer, or an individual — is the modern, easy way to sell fertilizer. Good spreading makes good fertilizer look better, while spotty and inaccurate spreading ends in spotty crop growth and an unhappy customer. If an excellent job of spreading is done, you'll sell more fertilizer. It will pay you, as it has paid so many other fertilizer companies, to actually prove to the farmer that your product will go further and do a better job if the best spreading equipment is used. Many companies demonstrate right in the field — showing a perfect pattern of just the right amount per acre — then and only then, in many cases, is the farmer sold.

### A NATURAL CO-WORKER!



This 20-ton Self-Unloading Bulk Transport covers more territory and handles more material with fewer trips and at lower cost. The "NEW LEADER" Bulk Transport unloads either at ground level or, when equipped with optional 14-foot hydraulically-operated elevator, above the ground either into bins or spreader trucks. Available in 5 to 25 ton capacity and in lengths from 11 feet to 40 feet.

The "NEW LEADER" Commercial Fertilizer Spreader is a complete spreading service in one unit. Blankets every acre evenly and uniformly. Never too much, never too little, regardless of speed, field conditions, or changes in gear. Retaining its ability to spread in the larger quantities, this unit can spread as little as 100 pounds to the acre with complete accuracy.

Bulk buying and handling, plus a "NEW LEADER", makes it possible for dealers to give farmers custom fertilizer spreading service at the cost of the bagged product alone.

Available in job-tailored capacities of 4% to 8 cubic yards.

### I WANT A DEMONSTRATION

Okay, show me! Tell my nearest distributor to call on me with complete proof! Also send me literature on:

- Combination Spreader     Bulk Transport     Bulkmaster  
 Complete Line

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



HIGHWAY EQUIPMENT CO. Inc.

633 D Ave., Northwest,  
Cedar Rapids, Iowa

See the "NEW LEADER" way to Greater Savings in Action — Write your distributor for a demonstration — or write the factory.

Prove It To Yourself!

# FIRST in the Field...



FIRST with direct simple motor drive on distributor. For even width of spreading, along with the ground drive and its positive, even volume control, this feature enables you to do a better spreading job with either single or double distributors.

FIRST to develop new DIRECT GROUND SPEED DRIVE. Eliminates gear reduction cases, power take-offs, hanger shafts, bearings, etc., eliminates 75% of replacements. Doubles spreading speed. Does away with "spotting" due to variations in speed and gear-shifting.

1. FIRST to pioneer truck-mounted spreading.
2. FIRST truck spreader with either belt or chain conveyor.
3. FIRST truck spreader with single distributor.
4. FIRST truck spreader with double distributor. (used originally for man).
5. FIRST truck spreader with worm reduction drive.
6. FIRST truck spreader with straddle bearings in worm reduction drive.
7. FIRST truck spreader with forged steel hub in (Navy) bronze ring gear.
8. FIRST truck spreader to use under-slung distributor.
9. FIRST to use 38° sloping sides. (later optional only; 45 degree standard).
10. FIRST to develop both center and rear dump for year 'round hauling.
11. FIRST to develop wooden "V" type body.
12. FIRST to furnish catwalks or wheel guards.
13. FIRST to use combination steel and wooden bodies.
14. FIRST to build all-steel bodies.
15. FIRST to use alloy steel in spreader bodies.
16. FIRST to pioneer fertilizer spreading with "V" type body.
17. FIRST to develop cross type fertilizer and fine lime spreader (Model "O").
18. FIRST to develop hood type spreader; (used in Europe for several years) before introducing in competition with Model "O" spreader for wind control of powdered lime and fertilizer.
19. FIRST and only hood to direct spread to ground, tapering spread for perfect lapping, instead of stopping material and leaving heavy streaks.
20. FIRST to use compartmentalized body for multiple loads.
21. FIRST to develop trouble-proof trip doors.
22. FIRST to use a positive numbered feed adjusting door with 64 distinct settings, always giving same volume.
23. FIRST to build a transport with hydraulically suspended rear conveyor for hauling and transporting bulk.
24. FIRST to use large, double swinging endgate.

**FREE! "THE ART OF SPREADING"**  
WRITE TODAY FOR YOUR COPY OF  
THIS NEW BOOKLET



**BAUGHMAN MANUFACTURING COMPANY**

132 SHIPMAN ROAD

\*

JERSEYVILLE, ILLINOIS

AGRICULTURAL CHEMICALS

The late Owen W. Ingram founded the concern in 1940, then known as Ingram's Gypsum Sales. In 1950, the bulk sale of gypsum was discontinued in favor of fertilizers, largely liquid. It was then that the Jenans came into the concern as partners of Ingram. Upon the death of O. Ingram in 1952, the concern was reorganized and given its present name. A substation is being developed at Firebaugh for distribution of both liquid and dry materials to west-side farmers. Application service is being provided for liquid fertilizers, including aqua ammonia.

Emco Co., Fresno, was organized in 1950 by Mrs. Emma Colvin and Mr. Mitchell Scaff. In 1952, I. Prandini purchased Mrs. Colvin's interest. He is president, Mr. Scaff is vice-president and Leonard Anderson is office manager. The plant is equipped with a modified Burton drum mixer of 20 tons per day capacity. "Fresno Brand" mixed fertilizers, formulated here, and a complete line of pesticides, are sold throughout the southern two-thirds of the San Joaquin Valley. The concern also formulates custom mixed feeds for sale by C. W. Roen Co. of Fresno and Santa Cruz, California.

The Naco Fertilizer Co. plant at Madera is managed by M. Di Gregory. It features an 80 ton per day capacity Sturtevant dry mixing plant, and 22 bulk material storage bins. The head office is in San Francisco. L. H. Odell is president, and Harold E. Ferguson is vice-president and general manager. (The San Francisco office and the Los Angeles plant of Naco were described in November, 1952 Agricultural Chemicals).

The plant of C. H. Haas Co. was established by Carl H. Haas in 1944. His brother, Otto Haas, is vice-president, and John Doswald is plant manager. Equipment includes an 80 ton per day Stedmann dry mixing plant equipped with a valve bag packer. Richland brand mixed fertilizers are sold in the San Joaquin and Sacramento Valleys.

In Modesto, about 5 miles north of Ceres, is located the Chemical Fertilizer Co., of which Wayne W.

Jones is the managing partner. Harry M. Pierce is sales manager; Duncan A. Sim, production manager; and Murray Bates is in charge of Sacramento sales. "Producer" brand mixed fertilizers, tailored to local needs, are sold in San Joaquin and Sacramento Valley areas served.

The Growers Fertilizer Co. was formed in 1924 as a subsidiary of Lewis, Simas and Jones Company. Frank Jones became the sole owner in 1940, and E. R. Mog was engaged

as plant superintendent in 1933 and became manager in 1937. The plant is equipped with a Sturtevant mixing unit of 80 tons per day capacity, and is served by both rail and truck. Stockton is served by deep water shipping, which facilitates handling of raw materials. A sheep manure plant in Lovelock, Nevada supplies Growers with pulverized sheep manure, which is used as a conditioner in the mixing of fertilizers, and sold alone at retail for home and garden

# NEW products

## Let Us Add aldrin

TO YOUR LINE OF INSECTICIDES!

**aldrin** the most talked-about insecticide in recent years is now available to you for sale under your own brand name! Yes, with our unique service, you can market this super-effective pest control without risking a cent in increased overhead. You invest nothing in equipment, you add no extra personnel, you need not expand factory or warehouse space. Our operation takes care of everything. We supply you **aldrin**, package it under your name, warehouse as necessary and ship at your instructions.

In short, you get America's foremost insecticide—a product that has been field-proved for effectiveness against such damaging soil pests as rootworms, wireworms, white grubs, cinch bugs, green June beetle larvae, European chafer grubs, sugar beet maggots, Japanese beetle larvae . . . and perhaps most important, against the ever dangerous grasshopper—without assuming any production headaches or expense.

There are big earnings to be made with miracle **aldrin**—so why not investigate our no-risk way to a safe, dependable **aldrin** supply? Write, wire or phone for full details.





**NOW YOU CAN GET . . .**

## **Republic top-quality Ammonium Sulphate BULK OR BAGGED—IN CARLOAD LOTS**

Republic's free-flowing Ammonium Sulphate is now available in bulk form or bagged. It is ready to be shipped to you in carload lots promptly and at regular intervals.

For more information on Republic's top-analysis Ammonium Sulphate, contact or write to:

**REPUBLIC STEEL CORPORATION**  
**REPUBLIC BUILDING • CLEVELAND 1, OHIO**  
Export Department: Chrysler Building, New York 17, New York

**REPUBLIC**  
**AMMONIUM SULPHATE**



use. "Groxit" brand mixed fertilizers are sold to farmers in the San Joaquin and Sacramento Valleys and in the North Coast wine grape area.

While a soils and tissue testing laboratory is by no stretch of the imagination a fertilizer mixing plant, the services provided by these professional technicians is closely identified with proper use of mixed fertilizers. J. H. Nelson, operates the Nelson Laboratories, Stockton, which features soils and tissue testing.

This new, modern building was put into operation in 1946. They specialize in work in the agricultural chemical field, including soil surveys, analysis of soils, plant tissues, feeds, fertilizers, hay, etc. In 1940 Nelson began work in cooperation with the University of California in production of legume bacteria, which his laboratory produces and markets under the trade name of "Cal-Rhiz." Other commercial laboratories offering similar service are George W. Gooch Laboratories, Los Angeles, and Curtis and Tompkins, San Francisco, who are also associate members of the CFA.

(To Be Continued)

## FRUIT PESTS

(From Page 63)

several major pests in orchards in various states. Plum curculio had appeared as far north as Jackson County, Illinois and Wicomico County, Maryland, by April 8, and eggs were being found in peaches in Georgia and Arkansas. Aphids were hatching in apple orchards in several New York counties early in the month as well as in fruit-growing states to the south. Catfacing insects such as stink bugs and plant bugs were out in peach orchards in Indiana, Illinois and Maryland. ★★

## FERTILIZER TECHNOLOGY

(From Page 40)

crease of about four cents per unit of nutrient. For a so-called average grade of 25 units, this would correspond to one dollar per ton. The

data shown in Figure 9 represent single-shift operation for both processes, assuming an output of about 60,000 tons per year.

The only nitric-phosphate process for which sufficiently detailed cost estimates were available to allow some comparison is the nitric-sulfuric process described by TVA and NFA (12, 15). Figure 10 compares this process with the conventional one

on the basis of two plant sizes: 50,000 and 200,000 tons per year. A rough breakdown of the over-all cost of producing fertilizer is given and estimated plant investments are shown. Although the breakdown in Figure 10 does not show it, detailed study of the estimates by NFA suggested that processing costs in the nitric-sulfuric process would be higher than for the conventional process.

A NEW  
INSECTICIDE  
CARRIER!

# SEMINOLE

Pretreated  
ALUMINUM  
SILICATE

- Uniform particle size.
- Uniform pH.
- Water-washed product.
- Purged of all grit.
- Very low viscosity in water at 60% solids without the addition of wetting agents.
- Non-abrasive.

For further information or samples, write...



SOUTHERN CLAYS, Inc.

33 RECTOR STREET • NEW YORK 6, N.Y.

**WHICH  
BUCKET  
IS  
RIGHT  
FOR  
YOU?**

Which type will best fit your requirements . . .  
 should buckets be chain or belt mounted . . .  
 should the unit be inclined or vertical?

The answer is relatively easy, but it takes an expert to select the *one* type of bucket elevator and the proper specifications for it that will do the most efficient job for you . . . at the lowest over-all cost. The type of material to be handled, weight of material, number of operating hours per day, space and capacity requirements . . . all these factors enter into the proper selection and application of a bucket elevator. So, for your bucket elevator needs, why not do as so many other companies do . . . refer your problem to "bucket elevator headquarters" . . . CHAIN Belt Company.

The experience of more than half a century . . . the correct engineering that delivers full rated capacity, full production for your plant . . . the balanced bucket elevator design assured because Chain Belt designs and makes all its own bucket elevator parts . . . are yours from Chain Belt Company.  
 For complete facts, write Chain Belt Company,  
 4795 W. Greenfield Ave., Milwaukee 1, Wis.

**CHAIN BELT  
COMPANY**

District Sales Offices in all principal cities.  
 Export Offices: Milwaukee 1, Wis. and 19 Rector St.  
 New York, N. Y.

To get best results from your conveyor and  
 bucket elevator, feed them right . . . not too  
 little . . . not too much . . . but just right  
 with Rex® Apron Feeders.

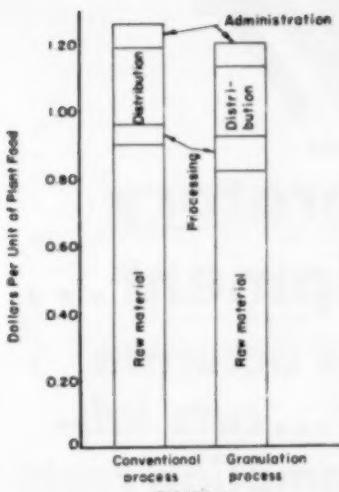


FIGURE 9

ESTIMATED OVER-ALL COST DISTRIBUTION  
Conventional and granulated Fertilizer Processes  
Midwestern Location

Source: Battelle Memorial Institute (3)

#### Administration Cost

Only in the case of the granulation process, illustrated in Figure 9, was a comparison of administration cost possible. The estimate for the granulation process indicated no significant change in administration cost compared with the conventional process. It is reasonable to assume that this will also be true for continuous acidulation as well as for continuous ammoniation and mixing. Somewhat higher costs may be expected for the nitric-sulfuric process, where a nitric acid plant must be operated in addition to the usual fertilizer facilities.

#### Distribution Cost

Here again, only the granulation process could be compared directly with the conventional process. The saving estimated for the granulation process was about two cents per plant food unit, or an average in the neighborhood of 50 cents per ton.

A large fraction of these savings may come from the use of cheaper bags. Granulated goods do not cake as readily as "powdery" goods and can therefore be put in a cheaper package. Experience has also shown that granulated goods sometimes have a higher bulk density than "powdery" goods, which allows the use of a smaller bag. The savings from these two factors alone can amount to about 38 cents per ton.

Some labor savings may also be

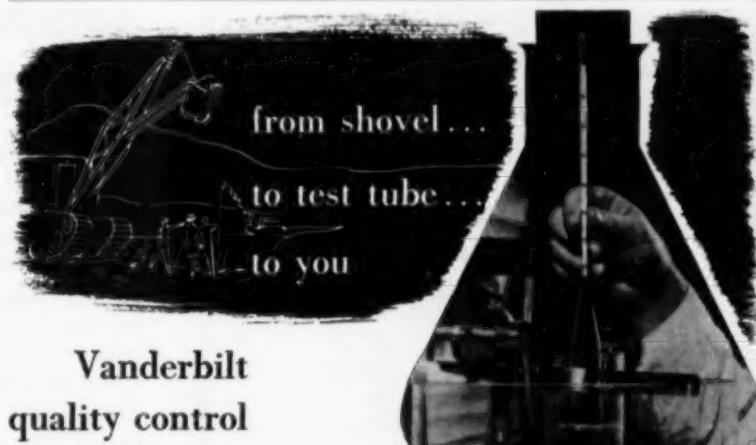
expected because (1) less blasting of finished-goods storage piles will be required; (2) less crushing of large blocks from storage piles will speed movement from pile to bagging mill; and (3) the better flow characteristics of granulated materials may allow speeding up the bagging machine.

The above figures were based on an average plant food content of about 25 units. It is quite apparent that distribution costs will practically halve when the plant food content

is doubled, a strong incentive for the production of more concentrated fertilizers.

#### Over-All Cost Reductions

**A** STUDY of Figures 8, 9, and 10, and the detailed data used to prepare these figures led to the following conclusions: (1) with concentrated formulas of high nitrogen content, such as an 11-11-11, the nitric-sulfuric process promises lower costs per ton than the conventional process, but further study would be



## Vanderbilt quality control all the way

guarantees improved effectiveness for your Agricultural Dusts and Sprays. Vanderbilt carriers, diluents and dispersing agents have become foremost because of this quality standard.

**PYRAK ABB** is the most widely accepted and used Pyrophyllite in the agricultural field. An outstanding carrier for insecticides and fungicides, and many other applications.

**DARVAN #1 & #2** are recognized as excellent dispersing and suspending agents for wettable concentrates. Tests indicate small amounts of Darvan increase the efficiency of the toxicant.

**CONTINENTAL CLAY** is a highly compatible and non-alkaline carrier for high bulk dusts. Equally remarkable is its dispersibility in wettable concentrates. Vanderbilt quality control *all the way* has produced these fine products . . . through private Company development of its own properties and mineral rights . . . operation of its own manufacturing plants and processes . . . its own constant and rigid laboratory supervision . . . and its own technical sales and service staffs.

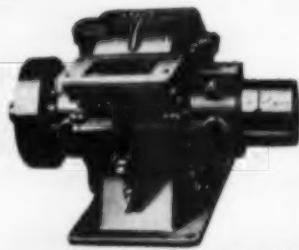
If you are seeking higher performance for your products, contact Vanderbilt today.


**R. T. VANDERBILT CO.**  
 SPECIALTIES DEPARTMENT  
 230 PARK AVENUE, NEW YORK 17, N. Y.  

Please send Bulletin D23 • Please send a sample of  
 PYRAK ABB     DARVAN     CONTINENTAL CLAY

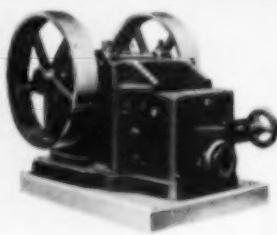
NAME \_\_\_\_\_  
 POSITION \_\_\_\_\_  
(Please attach to, or write on, your company letterhead)

# STURTEVANT



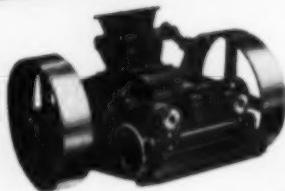
**LABORATORY SWING-SLEDGE MILLS**

Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



**LABORATORY JAW CRUSHERS**

Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 to 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.



**LABORATORY CRUSHING ROLLS**

First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from  $\frac{1}{2}$  in. to 20 mesh — and for the 12 x 12 size from  $\frac{3}{4}$  in. to 20 mesh.

## Laboratory **Equipment...**

**assures accurate  
samples... cuts lab-  
oratory sampling costs**

Sturtevant laboratory equipment have all the features of full-sized production machines with extra accuracy and wider range of adjustment built-in. They are fast... provide true samples of every batch processed.

All Sturtevant machines have "open-door" accessibility which permits quick, thorough cleaning... prevents the possibility of previous batches from contaminating new samples. Their rugged construction assures round the clock operation with practically no maintenance.

Investigate Sturtevant equipment for your laboratories. They will help you cut sampling costs... improve product quality... increase sales. Write for catalog, today.



**LABORATORY SAMPLE GRINDER**

Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

## **STURTEVANT MILL COMPANY**

123 Clayton Street, Boston 22, Mass.

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

AGRICULTURAL CHEMICALS

required to see if this also holds for a conventional process combined with a granulation step; (2) the nitric-sulfuric process loses its advantage for low-nitrogen formulas; (3) quite independent of formula, cost reductions of several dollars per ton are definitely possible by either modifying or replacing the conventional process.

#### Capital Requirements

**C**APITAL is needed for any process improvement, from about \$25,000 for a continuous ammonia-tor, to over \$6 million for a nitric-phosphate plant. Some published data<sup>(12)</sup> indicate that the return on the investment for a 50,000-ton-per-year nitric-phosphate plant is less than for a conventional plant of the same capacity. However, no accurate figures are available comparing the return on investment for these two processes for a 200,000-ton-per-year plant. Because of the many assumptions required, nothing short of a study of a particular manufacturer's operations and an equally detailed study of the characteristics of his regional market can furnish a reliable estimate of the minimum or maximum investment that will yield him an attractive return. Even without doing this he can be pretty sure that he will have to invest some money sooner or later to maintain a competitive position in the market.

#### Other Factors

**C**ERTAIN factors other than cost may also bring about changes in fertilizer technology. Community emphasis on air and stream pollution may force a change to new processes which will create not only cleaner, but also tidier-looking fertilizer plants. The trend toward bulk application methods for fertilizer on the farm, with its attendant savings to farmers, may bring about a different distribution system for the manufacturer. Also, there are indications that fertilizer consumers object to "dustiness" and like not only the freedom from dust that granulated fertilizers grant, but also the very appearance of the material. In a competitive market,

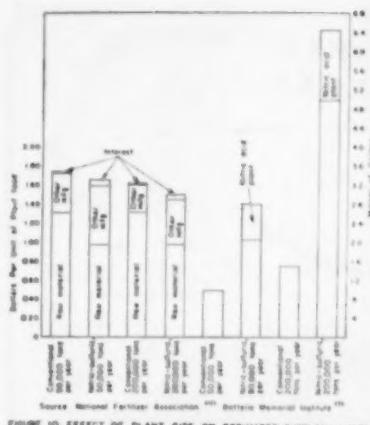


FIGURE 10 EFFECT OF PLANT SIZE ON ESTIMATED OVER-ALL COST AND CAPITAL INVESTMENT REQUIREMENTS FOR CONVENTIONAL AND NITRIC-SULFURIC FERTILIZER PROCESSERS, WESTERN LOCATION

such factors, even though many of them are largely "psychological", may well prove to be decisive.

#### Conclusions

**O**NLY a glance at the multitude of factors affecting the changing technology of the fertilizer industry has been possible. It has been found that much more quantitative information is needed to draw a detailed and accurate picture. Nevertheless, some things have become quite apparent. Under favorable circumstances, the new processes for manufacturing fertilizers have certain inherent advantages. The biggest of these is a lower raw materials cost per unit of plant nutrient in the product. Others, of variable merit, are the ability to manufacture higher analysis goods, to produce a granulated product, and to be operated continuously. A by-product of the modern integrated fertilizer plant may be the added flexibility which may permit selling directly to the chemical industry such things as ammonia, nitric or phosphoric acid, or their salts. When the fertilizer market is soft, this would provide a certain degree of independence from it which conventional fertilizer plants do not possess. A lot will also depend on the geographical location of a plant, which may determine whether the best unit is a modified conventional plant producing 50 to 75,000 tons per year, or a new type plant producing several hundred thousand tons per year.

We are today in the middle of a revolution in the fertilizer industry,

# Berkshire SPECIALISTS in MAGNESIA for AGRICULTURE

EMJEO (80/82% Magnesium Sulphate) Calcined Brucite (fertilizer grade) 70% MgO  
Calcined Magnesite 85 to 95% MgO

## POTNIT

(95% Nitrate of Potash)  
for  
Special Mixtures and Soluble  
Fertilizers  
Other Fertilizer Materials

## INSECTICIDES - FUNGICIDES

Mercury Compounds  
for Agricultural Use

## DITHiocarbamates

Ferric — Zinc

## EXPORT-IMPORT

# BERKSHIRE CHEMICALS, Inc.

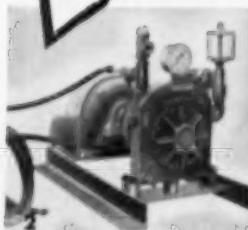
420 Lexington Ave., New York 17, N. Y.  
55 New Montgomery St., San Fran. 5, Cal.  
Cable Address — "Berksem" New York

## HAVE YOU OVERLOOKED ANY OF THESE IDEAS?

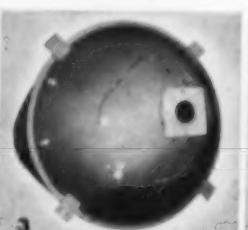
There are places in your fertilizer plants where low-cost Johnson accessories can profitably increase the efficiency of your bulk-material storage, batching and blending operations . . .



**Pivoted Distributor**  
feeds materials to multiple-section bins. Turns, locks by ground-level control.



**Rotary Vane Compressor**  
supplies 7 cu. ft. air pressure per min. to aerate silos, bins. 15-lb. limit-relief valve.



**Aeration Fittings**  
properly spaced in storage bins and silos keep bulk materials fluid, free-flowing.



**Bin Gauges and Signals**  
accurately register "hi-low-levels". Automatic. Water and dust-proof.



**Rotary Plug Valve**  
controls flow of finest materials. Plug works freely in self-aligning bearings.



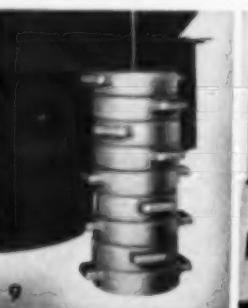
**Fill Valves**  
single-clam, radial-type, have choker weights on closing edge for jam-proof closing.



**Receiving Hoppers**  
all sizes, types for box-car, hopper-bottom car, truck, or bag delivery. Weather-tight.



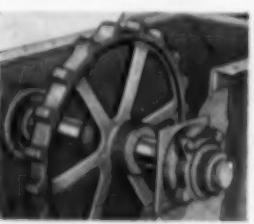
**Elevator Buckets**  
all-welded, light, smooth.  
• Two types, 7 sizes. Steel chain has carburized knuckles.



**Batcher Test Weights**  
are available in sets of nine, 50-lb. calibrated units, and two 25-lb. steel hangers.



**Elevator Safety Cage**  
28-in.-diameter ladder safety cage, welded to casing, costs only a few dollars per foot.



**Chain Sprockets**  
19-tooth chilled-rim cast iron with heavy split hub; 12-tooth cast-chrome manganese.

Mail to: C. S. JOHNSON CO., CHAMPAIGN, ILL.  
(Koehring Subsidiary)

Send us details  
on items checked: 1 2 3 4 5 6 7 8 9 10 11

NAME \_\_\_\_\_

TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

DIVISION \_\_\_\_\_

STREET \_\_\_\_\_

CITY, STATE \_\_\_\_\_



J 347 "CP"

brought about largely by the increasing demand for fertilizer since the end of World War II. New companies were attracted into the field, and in general competition has sharpened among the old established companies. The fertilizer market will continue to grow, but not necessarily in direct proportion to our increasing demand for food. Increased farm productivity will come not only from greater use of fertilizer, but also from improved seed strains, application of insecticides and weed killers, new methods of farming, and probably many other fruits of science not foreseen now. The lessons taught by soil conservationists will do much to shape the pattern of future practices.

National politics will affect the future by determining such things as the extent of support of farm prices. World politics, by encouraging or discouraging food exports, will play its part. Food processing methods which would permit shipping U. S. farm products to the starving areas of the world at reasonable cost, would open new markets and tend to increase fertilizer consumption in this country. Development of new uses for farm products, other than food and clothing, could open up vast new markets for fertilizers.

Whenever the supply and demand are in balance, there is bound to be a sharpening of competition for the market. As always, the best and cheapest products will lead the field. It is the manufacturer's problem to take what steps are necessary to avoid becoming a marginal producer. What seems to be needed most is a much closer look at the fertilizer industry and its market than this review has presented. A careful study of all known factors, plus some enlightened speculation about the future, would help the fertilizer industry to solve the problems it is facing. By taking such steps, the fertilizer industry will continue to contribute to the welfare of this country and, ultimately, to the welfare of mankind everywhere.

### References

- Adams, J. R., Tremearne, T. H., Jacob, K. D., "Survey of the Superphosphate and Wet-Process Phosphoric Acid Industries in the U. S. in

- 1950-1951", U. S. Dept. of Agric., (1952).
2. Agricultural Statistics 1952, Table 675, U. S. Dept. of Agric., Washington, D. C.
  3. Battelle Memorial Institute, unpublished data.
  4. Chemical Economics Handbook, p 535-84, Stanford Research Institute.
  5. "Development of Processes for Production of Concentrated Superphosphate", Chem. Engr. Report No. 9, p 100, Tennessee Valley Authority (1949).
  6. Farm Chemicals, 1953.
  7. Fertilizer News, April 3, 1953.
  8. Fertilizer News, September 18, 1953.
  9. Fertilizer News, October 30, 1953.
  10. Fertilizer Review, Vol XVII, No. 2, p 10, (1952).
  11. "Fertilizer Use at the Half Century Mark", The National Fertilizer Association (1951).
  12. "Nitrophosphate Production Cost Estimates", National Fertilizer Association, March 5, 1953.
  13. Oil, Paint, and Drug Reporter, 1953.
  14. Process Progress, Vol 3, No. 1, p 3, (1954).
  15. Stanfield, Z. A., "Economics of the Nitric Phosphate Fertilizer Processes", J. Agr. Food Chem., 1, 1054 (1953).
  16. Statistical Abstract of the United States: 1952 (Seventy-third edition), Table 5, U. S. Bureau of the Census, Washington, D. C. (1952).
  17. "The Wheat Situation", Bureau of Agricultural Economics, U. S. Dept. of Agriculture, WS-135, July-September, 1953, Table 5, p 21. ★★

## BEAR RETIRES

(From Page 58)

of America, past president and fellow of the Soil Conservation Society of America, and past chairman of the National Joint Committee on Grassland Agriculture. He is a member of the American Chemical Society, the American Society of Plant Physiologists, Phi Beta Kappa, and Sigma

### NO TIME TO READ?

That's what lots of people think . . . But you have to keep track of the important details that affect your business. . . . Put us on your information staff . . . We can help "keep you in touch with the industry."

A subscription ..... \$3.00/year

**AGRICULTURAL CHEMICALS**  
175 FIFTH AVENUE NEW YORK CITY

MAY, 1954

XI. The Philadelphia Society for Promoting Agriculture awarded him a medal as an "eminent agronomist" in 1952.

Dr. Bear has written two textbooks, "Theory and Practice in the Use of Fertilizers," now out of print, and "Soils and Fertilizers," now in its fourth edition. He is the co-author of three other books and many bulletins, circulars, and journal articles, both scientific and popular. Many of this country's best known soil scientists have taken their advanced degrees with Dr. Bear or have worked under his direction. ★★

## BEAR EDITORIAL

(From Page 58)

kept under control only by famine, pestilence, and war, and that this applies to all the peoples of the earth. But I would like to be classed among the optimists. I think this great land of ours can produce enough food to feed one billion people and to feed them well. We might not be able to afford so much meat, eggs, and milk per person, but there should be no need to go to bed hungry, as do millions of people in parts of the Orient every night.

I am convinced that the reason for the strangle-hold of the Malthusian principle on the peoples of China, India, Egypt and other hungry parts of the earth is because population got out of hand before science had come to the people's rescue. Now these overpopulated countries are so tied down by poverty, ignorance, disease, and all the other ills that go with undernourishment that they will have great difficulty in getting out from under the burdens that beset them.

In the United States, science has grown hand-in-hand with the population. We have the land resources, the technical know-how, and the will to do the things that must be done to continue to feed the millions of additional people as they arrive. In time we may have to fill up the gullies, bulldoze out the scrub trees, move deeper into the swamps, push higher up the mountain slopes, and edge our way farther into the desert. We may

Danitra

## WATER-SOLUBLE FERTILIZER FORMULATORS

## TRACE ELEMENTS FOR YOUR MIXES

We are now offering a new trace element blend called Danitra Micro-Nutrient Blend. Entirely water-soluble containing:

Magnesium	Iron
Manganese	Copper
Boron	Molybdenum
Zinc	

Compatible with most fertilizer materials—partially complexed and chelated.

We also offer POTASSIUM NITRATE as an excellent source of Nitrogen and Potash.

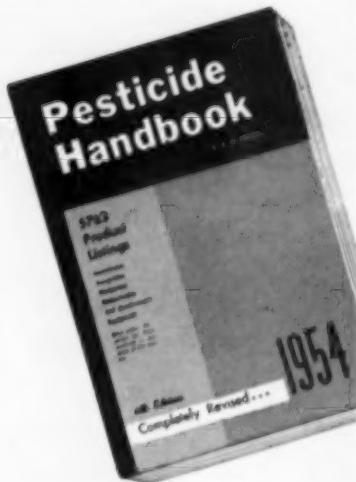
## PRIVATE BLENDING

We blend water-soluble fertilizers in our modern plant at Metuchen, N. J. for customers . . . under their own label. We invite your inquiries.

**Davies Nitrate Co.**  
INCORPORATED

● 118 LIBERTY STREET NEW YORK 6, N.Y.

# Completely Revised



UP-TO-THE-MINUTE  
**Edition**  
Reporting on over  
**5763**  
Trade Names

AN IMPORTANT BOOK FOR THOSE INTERESTED IN ANY PHASE OF PEST CONTROL

County agents, extension and research specialists, manufacturers, salesmen, jobbers, dealers, purchasing agents, health officers, farmers and librarians have found this publication to be extremely useful time and time again. *Pesticide Handbook* is the ONLY book giving complete up-to-the-minute information on over 5,000 commercial products, completely indexed by trade names, active ingredients and manufacturers.

#### at your fingertips—

You'll find a wealth of information on fungicides, insecticides, rodenticides, adjuvants, diluents, compatibilizers, antidotes, pest control equipment & professional pest control operators.

#### about the editor—

Dr. Donald E. H. Frear, Editor of PESTICIDE HANDBOOK 1954, is one of the leading authorities on the chemistry of pesticides. He is the author of "Chemistry of Insecticides and Fungicides," the first book dealing with this subject published in the United States. In addition, he has written several other books, including "Chemistry of Insecticides, Fungicides, and Herbicides." Dr. Frear is Professor of Agricultural and Biological Chemistry at The Pennsylvania State College.

Nearly  
200 Pages

**1.25**

Cloth Bound Edition..... \$1.25  
Postage included on prepaid orders

*Send Today*

**PESTICIDE HANDBOOK**  
P. O. BOX 798  
STATE COLLEGE, PENNSYLVANIA

even have to reclaim some land from the sea along our shores, distill seawater for irrigation purposes, and grow Chlorella protein foods under factory procedures. Possibly we can learn the secrets of the chlorophyll molecule and manufacture unlimited quantities of carbohydrates from water and air.

The essential point is that we take such steps as are necessary to see to it that we have plenty of energy that can be applied to the jobs ahead. We may have to harness the desert sun, take greater advantage of winds, tides, and waves, develop our atomic energy resources to the fullest extent, and search for other sources of energy.

But there is nothing on the horizon to indicate that we cannot produce all the food we can consume, and take care of all the other needs of our people as well. At the end of 70 years, I see no reason to be afraid of the future. We have a lot of well-trained young men and women who are prepared to take over as we older folks drop out of the picture. I suspect they will do a better job than we have done.

At the moment, our greatest opportunity in agriculture lies in vertical expansion — growing more on each acre rather than spreading out horizontally. And this is readily possible through increased use of the many compounds that have been placed at our disposal by the chemical industry. Liming materials and fertilizers constitute the starting point, with an annual application of 50 million tons in the United States alone. Then there are the insecticides, fungicides, weedicides, soil conditioners, hormones, detergents and many other highly useful chemicals. Use of DDT on white potatoes provides a good example of the phenomenal values of such products. Through the application of this insecticide, leaf hoppers were brought under control with resultant marked reduction in the incidence of virus diseases and an estimated yield increase of 100 bushels an acre on the potato fields of the nation. ★★

We  
manufacture  
at Curtis Bay, Maryland



**REPUBLIC  
CHEMICAL  
CORPORATION**

94 Beekman St., New York 38, N. Y.  
Telephone: REctor 2-9810  
Cable Address: Jaynivrad, New York  
Established 1924

**WANTED  
for Murder...**

CANCER is the cruellest enemy of all. No other disease brings so much suffering to Americans of all ages.

YET—though 23 million living Americans will die of cancer, at present rates —there is reason for hope. Thousands are being cured, who once would have been hopeless cases. Thousands more can have their suffering eased, their lives prolonged. And every day, we come closer to the final goal of cancer research: a sure and certain cure for all cancer.

THESE THINGS have all been helped by your donations to the American Cancer Society. This year, please be especially generous!

**Cancer**  
MAN'S CRUELLEST ENEMY  
Strike back—Give  
AMERICAN CANCER SOCIETY

AGRICULTURAL CHEMICALS

## BOYCE THOMPSON

(Continued from Page 36)

Dr. L. J. King observed that it became active in the soil. Dr. R. B. Carroll proved this was due to hydrolysis of the molecule. Dr. A. J. Vlitos immediately began basic research on the mechanism of the hydrolysis and found that sulfatase secreted by *Bacillus cereus* var. *mycoides* in the soil was responsible. From this basic information came the very practical development of "Crag Herbicide 1", a selective herbicide that could be used as a soil treatment —without fear of damaging nearby crops by drift.

It is obvious that fundamental and applied research were playing leapfrog with each other like two energetic boys. When the basic research was started by Drs. Zimmerman and Hitchcock, no one could have visualized what the final development would have been. Everyone can see, however, that both basic and applied research contributed to a program that neither could have done alone. Through them new basic concepts are available to those who wish to do research on weed control.

These rather enlightened viewpoints are only one factor contributing to the unique position occupied by the Institute in the agricultural chemical field. It is the only endowed institution in the United States dedicated entirely to the solution of agricultural and forestry problems. It has great freedom in choosing problems for investigation irrespective of the crop, product or geographic circumstance involved. Effort may be directed wherever it will do the most good.

Basic research programs do not have to yield immediate practical results provided constructive progress is made in solving basic problems. If information on how a pesticide operates will provide information on how to make a better pesticide, it can become a major problem. It has to compete for the available funds and facilities at Boyce Thompson Institute with studies on seed physiology, culture of insect tissues, physiology of

parasitism in fungi, nature of viruses, dormancy of buds, toxic secretions from insects and other problems that affect the welfare of men, their crops and their domestic animals.

Research findings, and reports of investigations by members of the staff are published in the quarterly periodical, *Contributions from Boyce Thompson Institute*. In addition, of course, technical articles based on current investigations are published in the trade journals. ★★

## BIOQUIN FUNGICIDE

(Continued from Page 62)

Over a four-year period Bioquin 1 was compared with other treatments for the control of blotch infection on the fruit (Table 3).

It was concluded that although Bioquin 1 was not quite so effective as ferbam, it did give good commercial blotch control. Of particular interest was the Bioquin 1-sulfur combination, which not only performed equally as well as the higher concen-

trations of Bioquin 1 alone, but approached the competitive price range of the commercial fungicides.

*Apple Bitter Rot (*Glomerella cingulata*)*. In 1946 it was demonstrated that Bioquin 1 (1 lb. to 100 gals.), in one application stopped bitter rot advance, whereas in adjoining plots treated with Bordeaux 4-6-100 and ferbam (2 lbs. to 100 gals.) 10 percent and 20 percent infection developed, respectively. Bioquin 1 was superior to the other materials in that it did not leave a visible residue on the fruit at harvest. In 1949, repeated applications of Bioquin 1 (1/4 lb. to 100 gals.) in the third, fourth, and fifth cover sprays prevented bitter rot infection, as compared to a 7 percent build-up in an adjoining block where it was not used. In another orchard in 1949, Bioquin 1 (1/2 lb. to 100 gals.), in two applications seven days apart starting with the first appearance of infection, eradicated the old infections and completely prevented further development of the disease.

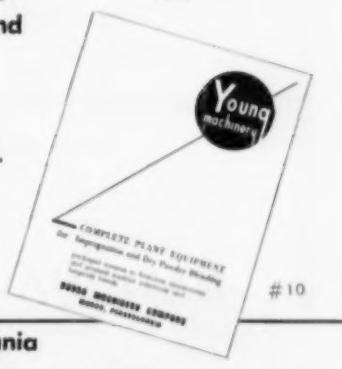
## Let Young Machinery solve your Insecticide Processing problems!



Over 70 efficient installations in U. S. A. and Foreign Countries.

Get your copy of new bulletin covering Complete Plant Equipment for Impregnation and Dry Powder Blending.

Write Young Machinery Co.  
Muncy, Pa. Today!



Muncy  
Pennsylvania  
Complete Plant Equipment for Dry Powder Blends, Concentrates and Emulsions



# An Opportunity

## Centennial of Entomology 1954

- Offers the industry an opportunity to tell the public about benefits from pesticides in their daily lives
- A chance to pay tribute to the scientists who have been instrumental in improving health and agriculture through pest control in this country and abroad
- A medium for presenting the importance of chemistry in our economy and to our well-being in war and peace

The celebration of the one hundredth year of professional entomology in the United States was created by agricultural, industrial and public health leaders to direct attention to the importance of pest control and to honor entomologists. Every opportunity should be used to carry a message about pest control through press, radio, TV, speeches and advertising during 1954.



**NATIONAL AGRICULTURAL  
CHEMICALS ASSOCIATION**

910 SEVENTEENTH STREET, N. W.

WASHINGTON 6, D. C.

Cedar Rust (*Gymnosporangium juniperi-virginianae*). In 1947 an orchard of 25-year-old Jonathan apple trees bordered by redcedar trees was divided into three large blocks. One block received Bioquin 1 (1 lb. to 100 gals.) the second block ferbam (1 lb. to 100 gals.) in the pink, full bloom, calyx, and first and second cover sprays. The third block was given the standard wettable-sulfur fungicide schedule. On July 3, a fruit count showed no cedar rust in the ferbam block, in the Bioquin 1 block 10 percent fruit infection, and in the sulfur plot 72 percent fruit infection. Thus, although Bioquin 1 gave good control, it was inferior to ferbam and much more costly.

Scab (*Venturia inaequalis*). The efficiency of Bioquin 1 in controlling apple scab is apparent from the data in Table 4.

The Bioquin 1-sulfur combination performed comparably to the other commercial fungicides and was definitely superior to the full strength sulfur program. In addition to these tests, large plots were arranged in commercial orchards in 1948 and 1949, and in every case the Bioquin-sulfur schedule gave excellent commercial control of scab.

*Fabraea Leaf Spot* (*Fabraea maculata*) of Pear. In 1947 Bioquin 1, ferbam, and wettable sulfur were compared for leaf-spot control in a 40-acre block of Kieffer and Garber pears. The results are shown in Table 5. Bioquin 1 proved to be as efficient as the other materials. Defoliation from *Fabraea* leaf spot had been a serious problem in this orchard in previous years and it is interesting that the moderate schedule employed was so effective.

Miscellaneous diseases. Many field tests comparing Bioquin 1 (1 lb.

to 100 gals.) with other materials were conducted against fire-blight (*Erwinia amylovora*) of apple and pear. Although Bioquin 1 did partially control fire-blight infections, it was never so efficient as Bordeaux mixture 2-4-100. In 1949, sooty blotch (*Gloeodes pomigena*) and fly speck (*Leptothyrium pomi*) were adequately controlled with Bioquin 1 (1/4 lb. to 100 gals.) when applied in the third, fourth, and fifth cover sprays on apple. There was no evidence that Bioquin 1 either would or would not control frogeye leaf-spot—or black rot (*Phylospora obtusa*).

Phytotoxicity. Bioquin 1 (1/4 lb. to 100 gals.) with or without sulfur, is considered extremely safe to use on the most tender fruit foliage. The 1/2 lb. to 100 gals. concentration was non-injurious to the above tests, but might cause slight fruit russet to Golden Delicious under some climatic conditions. The 1 lb. to 100 gals. dosage will usually give a typical copper injury, although in the test on pears no injury was noted.

Summary. Bioquin 1 was compared with a number of commercial fungicides in field tests on apples and pears. It was excellent against bitter rot, fly speck and sooty blotch; good against apple scab, apple blotch, and *Fabraea* leafspot of pear; and fair in the control of cedar rust. It was not satisfactory in controlling fire-blight. At concentrations suitable for disease control Bioquin 1 was not phytotoxic.

#### NH<sub>4</sub>NO<sub>3</sub> Scarce in '54

"Although fertilizer supplies for 1954 will be about 11 per cent higher than last year," reports a recent *Vermont Farm News* bulletin, "ammonium nitrate is on the scarce list," and orders for this fertilizer should be placed now.

TABLE 5  
Pear leaf-spot test in 1947.

Treatment/100 gal.*	May 27	Percent leaf-spot	
		June 10	July 23
Bioquin 1, 1/2 lb.	0	1.4	1.7
Ferbam (76%), 1 1/2 lb.	0	.9	.8
Wettable sulfur, 8 lb.	0	.7	2.6
Unsprayed check	4	11.0	38.0

\*Sprays were applied at the calyx, 1st, 2nd, and 3rd cover periods.

## Work Safely! Wear A Respirator!

Every agricultural worker exposed to toxic insecticides such as Parathion, TEPP, Systox, Aldrin, Toxaphene, BHC, Chlordane, etc., should wear a respirator. Some of these are almost odorless—others are nauseating—ALL ARE TOXIC!

Effective protection is provided by Willson Agrisol and Agri-Tepp respirators. They are light in weight, comfortable, eliminate unpleasant odors and toxic danger and are U. S. D. A. tested.

Write today for the new bulletin describing the Willson line of protective equipment for agricultural hazards and colorful agricultural safety poster.



### AGRISOL®

Parathion, Aldrin,  
Toxaphene, Systox, etc.

### Agri-Tepp®

TEPP & HETP Compounds

No. 25 DUST RESPIRATOR—a filter respirator for protection against non-toxic dusts.



### MonoGoggle®

Lightweight, comfortable, all plastic eye protection for all sprays, dusts and impact hazards.

### Gas Masks

Lightweight, easy-to-wear full face protection for heavy concentrations of insecticides, grain fumigants and anhydrous ammonia. In writing for information on these gas masks, be sure to state the service for which the mask is to be used.



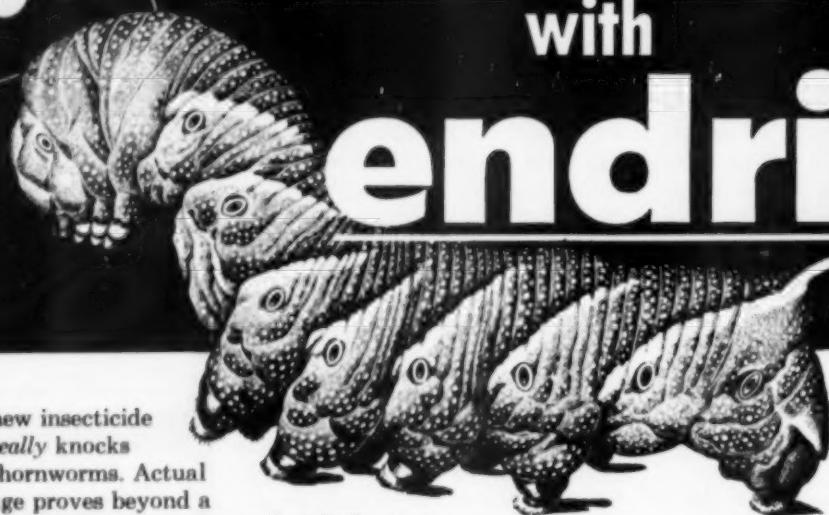
WILLSON PRODUCTS, INC.

Established 1870

116 Thorn St., Reading, Pa.

**Now**

# Tobacco Hornworm control with **endrin**



Shell's new insecticide endrin really knocks out the hornworms. Actual field usage proves beyond a doubt that not only hornworms but budworms, flea beetles and grasshoppers have finally met their match in endrin.

Plan to formulate endrin dusts and sprays now.  
Write for details.

**SHELL CHEMICAL CORPORATION**

AGRICULTURAL CHEMICALS DIVISION  
P.O. BOX 1617, DENVER 1, COLORADO

Atlanta • New York • St. Louis • Jackson, Mississippi

**liquid fungicide**  
for highly effective  
treatment of  
**CEREAL SEEDS**  
**VEGETABLE SEEDS**  
and for  
**ROOT ROT CONTROL**

**HLW EMULGATE  
MERCULINE**

the organic  
**MERCURIAL Emulsion Treatment**

- ✓ effective at reduced concentrations
- ✓ free from dusts and fumes
- ✓ easy to store, handle, mix, apply and to repack

Detailed Documentation Sent on Request

H. L. WOUDHUYSEN & ASSOCIATES

DIGBY 4-1857

**HLW**

Factory at Long Branch, N.J.

17 BATTERY PLACE • NEW YORK 4, N.Y.

## LEGAL ASPECTS

(Continued from Page 42)

product? If you cannot identify it precisely, can you narrow the production out of which it came?

Of course, the key to such identification or limitation is the use of batch numbers and retained samples. I recognize that the procedure for batching and taking retained samples may present substantial technical questions. It may be difficult to obtain the desired uniformity in a batch. You may assume that the plaintiff's attorney may cross examine closely on the procedure used in batching your production and taking samples. But these technical problems should not deter you from using batch numbers. Absolute uniformity throughout a batch will not be essential to its admissibility as evidence, although the greater the probability for uniformity, the greater the weight which would be given to this evidence.

How are batch numbers to be used to be of maximum value? The identification of each package by batch number is, of course, the most apparent and probably the most rewarding use of batch numbers. If the container of the questionable product is still available at the time the product liability action arises, the answer is simple. All necessary tests can be performed with the retained samples. Frequently, additional packages from the same batch can be located in the hands of other users.

But frequently the container has been destroyed by the time the action arises, ergo, the number of the questionable batch cannot be traced from the container. Does the use of batch numbers have any value in such a situation? It can have real value if the nature of your product and the method of distribution is such that it is practicable to record batch numbers on your shipping documents and invoices. If the product is shipped directly by you to the user, the designation of the batch numbers on the shipping documents may enable you to identify the questionable batch precisely, even though the container has been destroyed. If you ship to

a distributor, and the distributor sells to the user, the problem, of course, becomes more complicated. Even in this situation, the designation of the batch numbers on the shipping documents covering your shipment to the distributor may enable you either to identify precisely, or sharply limit the possible batches out of which the questionable product could have come.

I urge you to take all practicable measures to assure the effective use of batch numbers. I know of several recent instances in which the manufacturer was able to establish through the use of his batch numbers, that the offending contamination occurred after his product left his plant.

It would be foolhardy for me to attempt to discuss the question of the extensiveness and nature of the control tests which you should adopt as a part of your production routine. That must vary widely for different products. Nevertheless, I would like to emphasize the legal significance of such tests. It is axiomatic that these tests, in so far as is practicable, should cover all points on which

even a small departure from your established standards would affect the performance characteristic of the product. However, once you have determined upon the type of control tests which are to be made, reduce the procedure in writing in the form of instructions to employees. Make certain that a record is made of the results of all control tests. These control tests reach their maximum effectiveness as evidence if the jury can be shown the written procedure and the recorded results.

Our discussion has been directed primarily at the product liability facet of research and production control in marketing pesticides. Most of you either heard or have read the excellent panel discussion of pesticide-fertilizer mixtures at the 20th annual meeting (of NAC) last fall. (See Agr. Chemicals, Oct., 1953, pgs. 117-123) You will recall the discussion of the complex research questions presented by these mixtures—such questions as the persistence of residue in the soil, the possibility of

HAVE YOU TRIED . . .

# SER-X

The Test Proven  
Insecticide Diluent



Formulators Report  
Excellent Results

- ... Excellent drift Control Properties
- ... Better Flowability
- ... Neutral pH
- ... Desirable Suspension Properties
- ... Controlled Bag Weights
- ... Readily Compatible

For technical literature A-1 and samples, write . . .

## SUMMIT MINING CORPORATION

BASHORE BUILDING

CARLISLE, PENNSYLVANIA

**NO RAMMING OR JAMMING! NO SPINNING OF WHEELS  
WHEN LOADING BULKY OR "PACKED" MATERIALS**

LESSMANN  
**LoadALL**

## DIGS IN WHILE STANDING STILL!

### A HIGHLY MANEUVERABLE POWER SHOVEL

Lessmann LOADALL scoops up big loads of the most heavily compacted ingredients or finished fertilizers . . . does it in 5 seconds while standing still! Extra hydraulic cylinders supply Hydraulic Power Crowd. This means loading with hydraulics which eliminates ramming and spinning of wheels . . . minimizes repairs, reduces maintenance! Dozer blade is easily attached for yard maintenance. Crane-hook, lift forks, snow and trash buckets are also available.

### 9 FT. DUMPING CLEARANCE

LOADALL has clearance for the highest trucks, bins and mixing hoppers. It loads or unloads at any height from 12" below wheel level to 108" above. Wheelbase of 73" and 12' turning radius make it highly maneuverable.

### 52" REACH

Here's a full 4'4" reach at maximum clearance! LOADALL carries load close but quickly boosts it 'way out ahead for easier loading . . . another advantage of Hydraulic Power Crowd.

*Check These Features!*

✓ STANDARDIZED PARTS. Ford, Timken, Vickers, Bendix, etc., assure highest quality components and low-cost servicing.

✓ SAFETY. Operator has unrestricted visibility and is protected from loader arms.

✓ EASY HANDLING. Full reverse shifting gives LOADALL four speeds forward and four reverse. Three simple, conveniently located hydraulic controls assure efficiency.

✓ LOW COST. You save on first cost, operating costs and maintenance costs with a LOADALL.

✓ LOADALL BUCKETS. Available with capacities of  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $\frac{1}{2}$ , 1,  $1\frac{1}{2}$  and  $3\frac{1}{2}$  yards.



LESSMANN MANUFACTURING COMPANY

Branches of Lippert Steel Barrel Co., Philadelphia - Wilmington, Del.

2005 Easton Blvd., Des Moines 4, Iowa

Write for Complete Information TODAY!

## FROM THE WORLD'S STOCKPILES - TO YOUR PLANT . . .



*Woodward & Dickenson* serves you

with an 80 year reputation for reliability in quality, price and delivery.

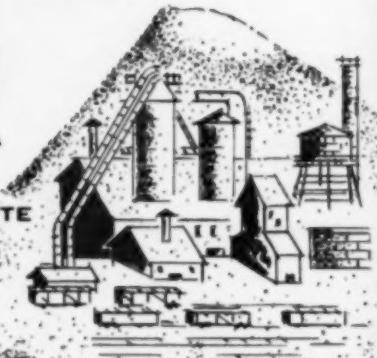
### POTASH

MURIATE  
SULPHATE  
NITRATE

### NITROGEN

SULPHATE OF AMMONIA  
AMMONIUM NITRATE  
CALCIUM AMMONIUM NITRATE  
UREA

AND ALL OTHER FERTILIZER AND FEED MATERIALS



ESTABLISHED 1873  
*Woodward & Dickenson*

1400 SOUTH PENN SQUARE, PHILADELPHIA 2, PA., U.S.A.  
TELEPHONE: LOCust 4-5600      CABLE ADDRESS: "Woodward"      TELETYPE: PH109

off-flavor, effect on soil organisms, and numerous other such problems. You will recall the stress upon the necessity for absolute uniformity in mixture, and the problems of sampling techniques and methods of analysis.

I would like to emphasize the product liability implications of these same problems which at that time were discussed from a regulatory standpoint. The observations made above with reference to the civil liability arising from violation of the statutory requirements of the Federal Insecticide, Fungicide, and Rodenticide Act, and the counterpart state laws, are equally applicable to the requirements of the various state fertilizer laws.

I would be remiss in my obligation if I failed to caution against the civil liability implication of these hazards and urge the necessity of research and control measures commensurate with the importance of these questions.

It is said that the law is a jealous mistress. At times she appears to be a little perfidious. Though she may hold you liable for crop injury which may arise from the hazards accompanying the use of your product, she does not permit you to share in the profits which may arise from increased production resulting from its use.

May I conclude my excursion into the realm of pseudoscience with the frank admission that I have only scratched the surface of this important subject. If this discussion has helped to make you aware of the legal implications of research and production control, if it has impressed upon you the fact that planning your research and production control program should be a joint undertaking between your technical personnel and your Counsel, it will have served its purpose. If it has accomplished these purposes, then I am confident that your technical personnel, in conjunction with your Counsel, will take up where this discussion leaves off, and adapt to the needs of your particular operations a research and production control program equal to the task of

defending your "poorest possible position" should you become mired in the technicalities of product liability litigation.★★

## COST ACCOUNTING

(Continued from Page 49)

2. Know all your cost facts, including the ones you cannot see easily.

3. Organize your cost facts so that they can be used for estimating profit results.

### Keep Reports Simple

Keeping reports simple depends on the exercise of good management thinking to define what is really required in the way of information to run the business. Once this has been established, then self-discipline is required to reduce the number of reports and the amount of figures to the required specifications, and to keep them that way.

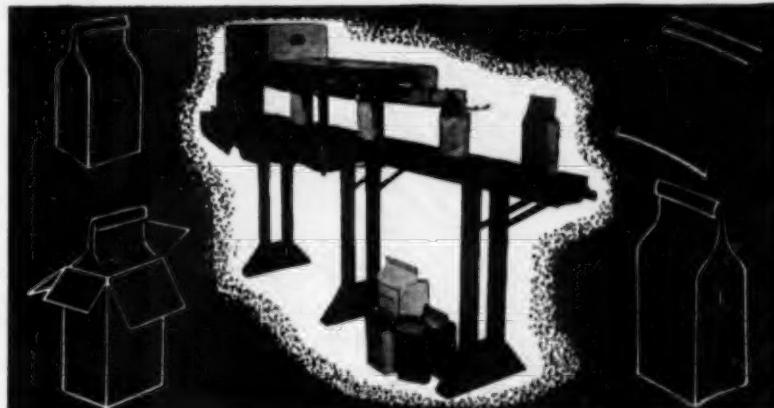
Another way of looking at this matter of simplicity is to recognize that there are limits to the use of

any accounting figures. Some figures may state the value of an inventory admirably, and yet those same figures may be very poorly suited to costing alternative management choices. So, if you want to keep reports simple and understandable, you will prepare figures with their end use in mind.

### Know All Cost Facts

Larger companies generally do a better job than smaller companies in the field of defining and knowing their costs. I think that all of us know at least one small processor who has run into serious financial difficulties because of his failure to provide for unexpected or hidden costs. There are inevitably major hazards and risks involved in this or any other industry. We should remember that these hazards and risks carry dollar signs. The suits being brought against members of this industry on the basis of alleged damage to persons and property cost money to defend, regardless of the outcome of

## FRY BAG SEALER



### Makes Sift-Proof Seals in Heavy Weight Paper Bags

Fry Model CSG automatically makes a double folded sift-proof heat seal in the top of any heavy weight paper bag. The first fold is securely heat sealed; the second is glued for extra safety.

Bags handled include polyethylene and polyfilm lined, polyethylenes coated and those with thermoplastic top sealing

Other models available . . . when writing, please submit a sample of your bag and your product.

bands. Simple adjustments for bags of various heights. This model also handles bags which are not heatsealable by giving the folds.

Machine above is perfect for granular or fine products such as insecticides, chemicals, powdered paints, fertilizers, dog foods, etc.

**GEORGE H. FRY COMPANY**

42 East 2nd St.  
Minesola, L. I., N. Y.  
GArden City 7-6230

**OLDBURY** 1896

*Quality...Uniformity...  
Technical service*

**SODIUM CHLORATE**

→ when you specify

**OLDBURY**  
ELECTRO-CHEMICAL COMPANY

Plant and Main Office:  
NIAGARA FALLS, NEW YORK

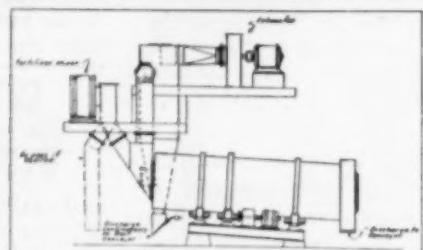
New York Office:  
19 RECTOR STREET, NEW YORK 6, N. Y.

*Greeff*

**DDT**

R. W. GREEFF & CO., INC.  
10 ROCKEFELLER PLAZA, NEW YORK, N. Y.  
TRIBUNE TOWER, CHICAGO, ILLINOIS

### ROTARY COOLER FOR AMMONIATED FERTILIZERS



This 6' x 20' cooler and dust collector can handle 40 tons of fertilizer per hour.

### Are you looking for a compact, high-capacity cooler?

Let us supply the rotary cooler to fit your requirements. Designs for any capacity are available in our shop. Cooled ammoniated fertilizers are better in every way — better because:

1. Reversion of available phosphate is reduced in low temperature storage piles.
2. Condition of mixed goods is greatly improved.
3. Caking is reduced.

4. Curing is speeded up which results in more efficient use of storage space and lowers handling costs.

Modernize your mixing operations with a cooler built by McDermott.

Note: These coolers are designed for operation under U. S. Patent No. 2305078—Hartford—assigned to E. I. du Pont de Nemours & Co. (Inc.) Wilmington, Delaware.

For detailed information write to  
**MCDERMOTT BROS. COMPANY**

Established 1896  
Equipment Manufacturers  
3rd & Washington Street ALENTOWN, PENNSYLVANIA

### HANDBOOK OF AGRICULTURAL PEST CONTROL

by S. F. Bailey and L. M. Smith

#### CONTENTS

- The Commercial Agricultural Chemicals
- Physical and Chemical Properties
- Compatibility
- Containers
- Fumigants and Fumigation
- Toxicology and Residues
- Spray Oils and their Properties
- Spraying Machines
- Rates of Delivery of Spray Machines
- Rates of Application for Sprays
- Dusts and Dusting
- Aircraft
- Mosquito Control
- Hazards
- Miscellaneous Topics
- Tables and Formulas
- Terms and Symbols

184 PAGES

\$3.25 in U. S. A.

*Send check with order*  
**INDUSTRY PUBLICATIONS, Inc.**

175 FIFTH AVE.

NEW YORK 10, N. Y.

the litigation. In the final analysis, there is only one place for this money to come from, and that is out of sales income. Therefore, sales prices should be set with that fact in mind.

Along the same lines, inventory problems also cost money. It is a fairly common occurrence to find your inventory in the wrong sections of the country to meet current demand. It then becomes necessary to tranship to another location in order to sell the goods. The additional freight costs, just like any other expenditure, should be provided for in sales income. In addition, all price setters should remember that only out of sales income can they obtain the funds to replace old equipment and depreciated assets. And if you are one of the larger companies in this industry, you will include in your costs those funds required to pay for research to improve your products.

#### Organize Your Cost Facts

Management planning really comes down to a choice among alternatives. No matter how restricted the business outlook may be, management has a freedom to choose to do this or to do that. Making a decision in business may be compared with making a decision in poker. Your decision is based not only on what you can see in your books, but also on what you think that your competitor sees in his books. In addition,

of course, your decision is shaped by considerations of markets, strategic advantages, future development possibilities, and many other factors. These imponderables and intangibles necessarily and properly play a great part in business decisions. However, it still remains true that one of the important factors involved in a choice between alternatives is the estimated profit result of one course of action compared with the estimated profit result of another course of action.

The cost figures of your business should be accumulated, handled and presented in such a manner that they can be used to predict profit results of different courses of action quickly and with reasonable accuracy. In other words, your cost figures should be based on the sort of approach which was used in the example of planned profits referred to earlier.

Sound accounting control practices and good forecasting and budgetary control techniques each year become more and more of a necessity for any business enterprise. At the present moment in the agricultural chemicals industry, many managements are facing decisions which call for a high degree of skill in estimating and measuring costs. Our example is representative of only one of many such situations.

Just one further comment. The industry you represent has contributed substantially to the well-being

of our economy. In making this contribution, your managements have obviously made more right decisions than wrong ones—and many such decisions have been made successfully without benefit of the most advanced accounting techniques. It is fundamental to recognize that an industry's men are more important than its accounting techniques. But it is also important, I believe, to recognize that management decisions can be made faster, and more soundly, and on more justifiable grounds, if they are made with the help of sound cost accounting procedures, and leavened with a dash of business judgment and imagination. ★★

#### BORATE HERBICIDES

(From Page 53)

tions of 10 ppm to 1000 ppm. The regression lines for the four test materials on oats are almost parallel throughout their range. In contrast to this, and considering the chart for beans (Figure 1), the regression line for sodium chlorate diverges sharply from those established for  $B_2O_3$ , Compound C, or Compound D. The degree and direction of divergence here indicates that beans are markedly less sensitive to the toxic action of sodium chlorate than to the boron containing compounds. The regression line graph for zinnias, by the degree of slope and close association of lines, shows this

(Turn to Page 135)

# PYROPHYLLITE

the ideal Diluent and Extender  
for INSECTICIDES

Improve the adhering properties of your dusts  
with Insecticide Grade Pyrophyllite

Ask For Our Pamphlet

**GLENDON PYROPHYLLITE  
COMPANY**

P. O. Box 2414, Greensboro, N. C.

Formerly Glendon Div., Carolina Pyrophyllite Co.

Plant and Mines at Glendon, N. C.

**Pyrethrum?  
Allethrin?  
ask  
MGK**

As acknowledged pioneers and recognized authorities in the correct use of pyrethrum, allethrin and their most effective synergists, MGK 264 and piperonyl butoxide, we offer standardized concentrates, extracts, dusts of guaranteed uniformity.

If your aerosols, sprays, or dusts include the use of the powerful, safe and spectacular knockdown agents, pyrethrum and allethrin, send your inquiry today. All requests for information answered by qualified authorities. Write.



**M C LAUGHLIN  
G ORMLEY  
K ING Company**

1711 S.E. Fifth Street • Minneapolis, Minnesota

**FOR EVERY CROP**

**FOR EVERY NEED**

**THERE'S A TeeJet SPRAY NOZZLE TO DO THE JOB**

Over 400 interchangeable orifice tips to fit any TeeJet Spray Nozzle . . . give you a choice to meet the need of any crop and any type of spraying. Tip types include flat spray, hollow cone, full cone, and straight stream. Try TeeJet Spray Nozzles . . . proved best in the field . . . guaranteed for exact performance.

**RELATED EQUIPMENT . . .** wide range of related equipment such as BoomJet for single nozzle broadcast spraying in patterns up to 66 feet wide . . . GunJet spray guns for spraying trees, cattle, and scrub growth . . . and strainers, connectors and fittings.

For complete information . . . write for Bulletin 58

**SPRAYING SYSTEMS CO.**  
3230 Randolph Street • Bellwood, Illinois • USA

Patent No. 3,619,678

## MODERN REBUILT EQUIPMENT

**UNION**  
Rebuilt  
Machinery  
Established 1912

### Available At Tremendous Savings

J. H. Day Dry Powder Mixers, 100 to 10,000 lbs. cap.  
Elgin 24-Head Rotary Vacuum Filler.  
Pfaudler King Stainless Steel Rotary Filler.  
Capem 1SF and 4-Head Automatic Cappers.  
F.M.C. Kyler A and Burt Wraparound Labelers.  
Mikro 4TH, 3W, 1SH, Bantam Pulverizers.  
Day 650 gal. Steam Jacketed Jumbo Mixer.  
Robinson, Tyler Hum-mer, Selectro and Great Western Sifters, all models.  
Stokes and Smith Model A and B Transwraps.  
Stokes and Smith GI and HG88 Duplex Auger Fillers.  
Ermold and World Semi and Fully Auto. Labelers.  
Standard Knapp #429 Carton Sealer.  
Oliver Automatic Adjustable Wrapper, for wrapping in kraft and cellophane.  
Package Machinery FA, FA2, FA4 Auto. Cellophane Wrappers.  
Hayasen 3"-7", 8"-18", 7"-13" Automatic Wrappers.

### IMMEDIATE DELIVERIES

Write, Wire, Phone Collect for Details and Prices  
On All Your Machinery Requirements

### UNION STANDARD EQUIPMENT CO.

318-322 Lafayette St. New York 12, N.Y.

## Manufacturers of AGRICULTURAL INSECTICIDES

### METHYL BROMIDE

(with 2% chloropiperin on option of buyer)

Also These EDCO Specialties:

#### DDT

Emulsion  
Emulsifiable Concentrate  
Wettable Powder  
Dust Base

#### ALDRIN

Emulsifiable Concentrate  
Dust Base

#### PARATHION

25% Emulsion  
25% Dust Base  
15% Wettable Powder

#### BHC

12 Gamma  
36 Gamma

#### TEPP-40

Tetraethyl Pyrophosphate

#### DIELDRIN

Emulsifiable Concentrate  
Dust Base

#### TOXAPHENE

40% Wettable Powder

#### LINDANE

### EDCO CORP.

Elkton, Md.

United States of America

Cables: "Edco", Elkton

## Classified ADVERTISING

Rates for classified advertisements are ten cents per word, \$2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, \$1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 175 Fifth Ave., New York 10. Closing date: 25th of preceding month.

### Situations Wanted:

**AGRONOMIST:** Wide field and greenhouse testing of herbicides. Formulated pesticides. Chemical, plant physiology and soils background. Prefers technical service or development. Address Box No. 855, c/o Agricultural Chemicals.

**FOREIGN SALES AND DEVELOPMENT REPRESENTATIVE:** Agronomist with wide experience in soils and agricultural chemicals seeks job as sales and development representative in Spain or any other Latin American countries. Spanish spoken fluently. Will consider offer in foreign export and sales department of agricultural chemical firm. Address Box No. 856, c/o Agricultural Chemicals.

**SALES MANAGER:** Agricultural and Industrial Chemicals. BS Degree, age 33, outstanding sales record. Seeks permanent alliance with small or medium chemical company. Address Box No. 857, c/o Agricultural Chemicals.

### FOR SALE

Official Publication  
Association of American Fertilizer  
Control Officials  
Postpaid \$1.25

Contents of this 95 page publication include: Directions for Sampling Fertilizers; Potential for Fertilizer Usage in the U. S.; Prospective Promotions for Plant Food; Higher Analysis Mixed Fertilizers as a Factor in More Efficient use of Plant Nutrients; A Proposed Model State Fertilizer Bill; and Some Manufacturing Problems and New Developments in Fertilizer Technology.

Order Direct From

AGRICULTURAL CHEMICALS  
175 FIFTH AVE., NEW YORK 10, N. Y.

### For Sale:

**STEEL TANKS FOR SALE:** Dished heads—all welded. Excellent for storing liquid fertilizer, chemical, etc. At Norfolk, Va. (3) 5800 gal; at Tonawanda, N.Y. (2) 7000 gal; at Brooklyn, N.Y. (10) 7650 gal; at Reading, Pa. (9) 4600 gal, (5) 4300 gal, (2) 3800 gal; at Philadelphia, Pa. (3) 13,700 gal, (4) 9150 gal, (2) 4400 gal. Perry Equipment Corp., 1428 N. 6th St. Phila., 22, Pa.

### Positions Available:

**WANTED FOR SOUTH AMERICAN SERVICE:** Plant manager fully qualified to operate modern insecticide plant, knowledge of mixed fertilizers desirable but not necessary. Furnish record of previous experience, age and full particulars. Address Box No. 858, c/o Agricultural Chemicals.

#### More Money For Jobbers!

BIONETIC proven by industrial and municipal waste treatment Technologists. Used by hotels, resorts, institutions, and cities. Cleans Septic Tanks and Cesspools. • Eliminates Odor. • Cleans Grease Traps. • National and Local Co-operative Advertising to Assist you! Write: RELIANCE CHEMICALS CORPORATION P. O. Box 6724, Houston 5, Texas

### FOR LEASE

New York office—for sublease. 1,000 sq. ft. favorable rental. Previous tenant seeking new occupant who will take over balance of lease and buy equipment which has been installed on basis of 60% of cost. Equipment includes acoustic ceiling, fluorescent lighting fixtures, 4 airconditioning units, etc. Space would be excellent for district sales office. Has five small private offices, stock room, general office area, washroom, mail room, etc.

Address Box 854  
c/o Agricultural Chemicals

### ALVIN J. COX, Ph.D.

Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippines Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISER ON AGRICULTURAL  
CHEMICAL PROBLEMS AND  
INVESTIGATIONS

Consultant in reference to spray injury and damage, diazo, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 Emerson Street  
Palo Alto, California

### Theodore Riedeburg Associates

Sales Consultants  
and  
Manufacturers' Representatives  
on  
Agricultural Chemicals

415 Lexington Ave.  
New York 17, New York  
Murray Hill 7-1488

### FORMULATING SERVICE

Single Batch Processing From Lab Size To  
Carload Quantities  
(from your raw materials or ours)

MACHINE FILLING AND LABELLING  
Complete Warehouse Service Available  
also  
Tankcar Shipments Stored and Packaged

We Do Not Distribute — Our Business Is  
"Custom Formulation"

LORENZ CHEMICAL CO.

17th & Nicholas, Omaha 2, Nebr.  
Serving the Nation from a Central Location

Year Around Facilities For  
Evaluating Agricultural Chemicals

### FIELD TRIALS in New Jersey and Florida

Dr. Well's Agricultural Laboratories  
Bridgeton, N. J. Hollywood, Fla.

### FLORIDA FIELD TRIALS

Evaluations  
of  
Agricultural Chemicals.

DR. G. R. TOWNSEND  
Box 356  
Belle Glade, Florida

### FRIAR M. THOMPSON, JR. Consultant

Specializing in insecticides, rodenticides, fungicides, weed controllers for industry, household, and farm.

Product formulation, testing, labeling.

Athens, Georgia

# You can rely on U.S.I. for

**CPR DUST**—Combining pyrethrins, piperonyl cyclopane and rotenone for quick kill of a variety of insects with no hazardous residues.

**ROTENONE**—A "natural" insecticide with low toxicity. Especially useful on truck crops and fruit.

**CIPC AND IPC CHEMICALS FOR HERBICIDES**—Pre-emergent application controls narrow-leaf plants, particularly annual grasses in cotton and other crops.

**ALLETHRIN**—the new synthetic insecticide. Combines low toxicity with high efficiency—highly compatible with most insecticides.

**PYRETHRUM**—unit for unit, still the most versatile and effective insecticide ingredient available.

**PIPERONYL BUTOXIDE**—The most active of all synergists for pyrethrin, allethrin, and certain other chemicals.

**PYRENONE®**—blending piperonyl butoxide and pyrethrin for the most effective and economical formulations in a wide variety of combinations.

\*Reg. U. S. Pat. Off., U.S.I.

**U.S.I. INDUSTRIAL CHEMICALS CO.**

Division of National Distillers Products Corporation  
120 Broadway, New York 5, N. Y.

Branches in all Principal Cities  
In Canada: Natural Products Corporation, Toronto and Montreal

## LET ON THE SPOT

**Simplex**  
SOIL  
TESTING



## INCREASE YOUR FERTILIZER SALES

**Easy • Quick • Accurate**

Peak crop productivity is seldom reached by the majority of growers because of the limited amount of fertilizer used. Testing in the field should enable your special formula reps to prove the need for additional fertilizer and thus increase his sales.

Commercial Simplex Soil Test Outfits are available in three sizes. Write today for our new catalog.

**THE EDWARDS LABORATORY** P.O. Box 318-N  
Norwalk, Ohio

## Fine Dusting Clays

### "Barnet Clay"

A NON-ABRASIVE clay mined under our personal supervision at Aiken, S. C. Available in carloads and truckloads; packed in 50 lb. de-aired bags.

### "Perry Clay"

A free flowing air-floated clay which has been used extensively for dusting for the past ten years. Available in carloads and truckloads; packed in 50 lb. de-aired bags.

Technical data and samples on request

**United Clay Mines**

Trenton, New Jersey

Fine Industrial Clays

**HYPRO**  
750



#### The original NYLON ROLLER PUMP

The Hypo 750 NYLON ROLLER Pump, engineered for a wide variety of heavy-duty pumping jobs—spraying, fire fighting, fertilizer application and insect control spraying—is designed to fit the power take-off shaft on tractors, trucks and road equipment. Instantly self-priming—delivers 15 gals. per minute at 600 r.p.m. Pressure range from 0 to 350 lbs. Features "Ni-Resist" case and rotor with tough, resilient nylon rollers for positive liquid displacement and long life. Permanently lubricated ball bearings and stainless steel shaft. Equipped with  $\frac{1}{4}$ " pipe connections, the HYPRO 750 mounts directly on tractor PTO shaft. Can be furnished with base plate and solid shaft for gas engine pulley drive. Weight 11 lbs.

#### The Pump for All-Around Use.

- Crop and Livestock Spraying
- Liquid Fertilizer Applications
- Cattle Truck and Stock Pen Flushing
- Fire Fighting
- Insect Control

For complete information, write Dept. 106

**HYPRO** ENGINEERING, INC.

404 No. Washington Ave.

Minneapolis 1, Minnesota

Look for the HYPRO nameplate. That nameplate means you have a HYPRO—the original—the finest!

## BOOKS FOR SALE

Insect Resistance in Crop Plants-\$9.80  
Weed Control-\$8.00  
Soils and Fertilizers-\$6.00  
Chemistry and Uses of Insecticides-\$6.75  
Soils and Soil Fertility-\$5.00  
Handbook of Agricultural Pest Control-\$3.25 in U. S. A., \$3.75 elsewhere  
Insect Control by Chemicals-\$12.50  
The Chemistry and Action of Insecticides-\$7.00  
Destructive and Useful Insects-\$10.00

(Add 3¢ sales tax  
in New York City)

Agricultural Chemicals  
175 Fifth Ave., New York

## BORATE HERBICIDES

(From Page 131)

plant to be about equally susceptible to the toxic action of boron trioxide or chlorate. In comparing the alfalfa and sweet clover graphs, it is interesting to note that sweet clover is considerably more resistant to all compounds tested than is alfalfa, as indicated by the degree of slope of the regression lines; both plants are more susceptible to boron trioxide than comparable applications of sodium chlorate, with this difference expressed most strongly in sweet clover.

Considering the lowest test concentration—10 ppm—it is evident that sodium chlorate was most toxic to beans, zinnias, alfalfa, sweet clover and oat seedlings. Statistical analysis shows no significant differences between reaction of any crop to sodium chlorate or boron trioxide at this low concentration.

At a test concentration of 100 ppm, seedlings of all crops showed a significant reduction in growth. Differences in response to compounds at 100 ppm were not significant for any of the test plants.

Test concentrations of 1000 ppm (approximately equivalent to 1 lb. in 120 gals. of water) showed boron trioxide to be more toxic than

sodium chlorate on all test crops with significant differences on beans and sweet clover. Beans have been rated as sensitive to boron; alfalfa and sweet clover as tolerant. Figure 1 indicates that beans, as well as sweet clover and alfalfa, are tolerant to sodium chlorate.

A degree of growth reduction consistent with satisfactory weed control was attained only at concentrations above 100 ppm of either compound. These, then, are the concentrations of practical importance and consideration; and in these investigations, boron trioxide at concentrations of 100 ppm or 1000 ppm consistently gave equal or better control of all plants tested than equivalent concentrations of sodium chlorate.

Figure 1 shows that 10 ppm concentrations of either Compound C or D were somewhat less efficient than straight chlorate on all test plants. In the case of beans, alfalfa, sweet clover, zinnias or oats, 10 ppm concentration of Compounds C or D did not significantly reduce growth increment below checks.

At 100 ppm, while the data of Figure 1 would indicate a slight advantage in toxicity for sodium chlorate over the mixed herbicides, on analysis there is no significant difference between treatments for any crop.

At 1000 ppm, the boron containing mixtures are significantly superior to sodium chlorate on beans. The high boron Compound C was superior to the lower boron Compound D on alfalfa and sweet clover. Data for all crops show no significant difference in reaction of these plants to 1000 ppm concentrations of Compounds C or D.

### Summary and Conclusions

THE data of Figure 1 are consistent with the earlier published research reports of Crafts and his coworkers (4, 5), and show the validity of present recommendations for field use of borates and chlorates as herbicides. They indicate also that under certain conditions, application based on equal unit area treatments with sodium chlorate or boron trioxide equivalent derived from borate salts are justified. The data emphasizes that on the range of plants tested, and

within the limitations of the methods outlined, a unit of boron trioxide is equivalent to a like unit of sodium chlorate as a plant toxicant.

These data further indicate that within the limitations of procedures used in this investigation, a unit of Compound C (25% sodium chlorate—75% sodium polyborates) is equivalent to a unit of Compound D (40% sodium chlorate—60% sodium polyborates), and that a unit of either is equivalent to a like unit of straight sodium chlorate at concentrations above 100 ppm in the soil water solution.

### References

1. Anonymous. 1953. Recommendations of the Research Committee of the North Central Weed Control Conference, Kansas City, Mo. Dec. 10, 1953.
2. Aslander, A. 1926. Chlorates as plant poisons. *American Soc. Agron. Jour.* 18:1101-02.
3. 1928. Experiments on the eradication of Canada thistle (*Cirsium arvense*) with chlorates and other herbicides. *Jour. Agr. Research.* 36:915-34.
4. Crafts, A. S. and Cleary, C. W. 1936. Toxicity of arsenic, borax, chlorate, and their combinations in three California soils. *Hilgardia* 10:401-13
5. — and Raynor, R. N. 1936. The herbicidal properties of boron compounds. *Hilgardia* 10:343-74.
6. Eaton, Frank M. 1944. Deficiency, toxicity and accumulation of boron in plants. *Jour. of Agr. Research.* 69:6 237-77.
7. Hoagland, D. R. and Arnon, D. E. 1950. The water culture method for growing plants without soil. *Circ.* 347:32 (Revised)
8. Hurd-Karrer, A. M. 1940. Comparative susceptibility of crop plants to sodium chlorate injury. U. S. Dept. Agr. Tech. Bul. 648:1-15.
9. Latshaw, W. L. and Zahnley, J. W. 1927. Experiments with sodium chlorate and other chemicals as herbicides for field bindweed. *Jour. Agr. Research* 35:757-67.
10. Litzenberger, S. C. 1941. The effectiveness of borax and sodium chlorate-borate combinations for the control of perennial weeds. *Montana Agr. Exp. Sta. War Circ.* 2:11.
11. Raynor, R. N. 1937. The chemical control of St. Johnswort. *Calif. Agr. Exp. Sta. Bul.* 615:1-38.
12. Robbins, W. W.; Bellue, M. and Ball, S.W. 1951. *Weeds of California*. State Dept. of Agr.
13. Snedecor, George W. 1941. *Statistical methods*. Fourth Edition. Published by College Press Inc., Ames, Iowa.
14. Timmons, F. L. 1941. Results of bindweed control experiments at Fort Hays, Kansas Br. Sta., Kansas Agr. Exp. Sta. Bul. 296:1-50. ★★

# one MAN



... with a  
**Portable Conveyor**  
and a B-G Car Unloader  
unloaded a car of coal in

# 45 MINUTES

see your B-G distributor  
or write

**Barber-Greene**

AURORA, ILLINOIS, U.S.A.

Lancaster, Allwine & Rommel

*Registered Patent Attorneys*

Suite 428,

815—15th STREET, N. W.

Washington 5, D. C.



Patent Practice before U. S. Patent  
Office. Validity and Infringe-  
ment Investigations and Opinions.

*Booklet and form "Evidence of  
Conception" forwarded upon request.*

1953

### Agricultural Chemicals Volumes

The 1953 bound volume of Agricultural Chemicals will shortly be available from this office. The cloth bound edition sells for \$14.75 (\$16.50 foreign).

We order only a limited stock of bound volumes which are offered on a "first-come" basis.

Add 3% sales tax in New York City

**Industry Publications, Inc.**

175 FIFTH AVENUE NEW YORK CITY

## "COHUTTA"

**POWDERED TALC**

An excellent carrier for insecticides and fungicides. Produced by

**Cohutta Talc Co.**

Dalton

Georgia

## Announcing

the new Tenth Edition of

## ENTOMA

A Directory of Pest Control Materials . . .

. . . Especially useful to manufacturers, salesmen, jobbers, dealers, purchasing agents, librarians, county agents, extension and research specialists, etc.

. . . Contains concise and ever ready information on insecticides, fungicides, herbicides, diluents, emulsifiers and adjuvants.

. . . Lists insecticides, fungicides, herbicides, rodenticides, spraying and dusting equipment, trade names, etc.

. . . Contains directories of pest control operators, commercial arborists, airplane sprayers, consultants, official entomologists, plant pathologists, etc.

. . . Published by The Entomological Society of America to aid those interested in pest control.

Price \$2.00 - Make check payable to Entoma

Order from

GEORGE S. LANGFORD, Editor

University of Maryland

College Park, Md.

*Index*  
to ADVERTISERS

American Agricultural Chemical Co.	Apr.
American Cyanamid Co.	31
American Potash & Chemical Corp.	72
Andrews, W. R. E. Sales, Inc.	93
Antara Chemical Div., General Dyestuff Corp.	75
Arkell & Smiths	10
Armour Fertilizer Works	Apr.
Ashcraft-Wilkinson Co.	6
Atlas Powder Co.	56
Attapulgus Minerals & Chemicals Corp.	4
Baker, H. J. & Bro.	98, 99
Bagpak Div., International Paper Co.	25
Barber-Greene	136
Baughman Mfg. Co.	112
Bemis Bag Co.	3rd Cover
Berkshire Chemicals, Inc.	119
Bradley & Baker	Apr.
Bradley Pulverizer Co.	Apr.
California Spray Chem. Co.	104
Carbide & Carbon Chemicals Co.	Apr.
Chain Belt Co.	116
Chase Bag Corp.	Apr.
Chemagro Corp.	92
Chemical Construction Corp.	Apr.
Cohutta Talc Co.	136
Columbia Southern Chemical Corp.	94
Combustion Engineering, Inc., Raymond Division	9
Commercial Solvents Corp.	Apr.
Continental Can Co., Shellmar Belter Div.	Apr.
Cox, Dr. Alvin J.	133
Davies Nitrate Co., Inc.	121
Davison Chemical Corp.	Apr.
Diamond Alkali Co.	60
Dorr Co.	Apr.
Duval Sulphur & Potash Co.	6
du Pont de Nemours & Co., E. I.	21
Diversey Corp.	101
Eastman Chemical Products, Inc.	90
Edco Corp.	132
Edwards Laboratory	134
Emulsol Corp.	Feb.
Flint Steel Corp.	105
Floridin Co.	22
Fry Co., Geo. H.	129
Fulton Bag & Cotton Mills	87

Ninol Laboratories, Inc.	67
Nitrogen Div.	II
Nopco Chemical Co.	Mar.
Oldbury Electro Chemical Co.	130
Pacific Coast Borax Co.	24
Penick, S. B. & Co.	29
Pennsylvania Industrial Chemical Corp.	103
Pennsylvania Salt Manufacturing Co.	14, 64
Phelps Dodge Refining Corp.	110
Phillips Chemical Co.	30
Pittsburgh Coke & Chem. Co., Agricultural Chemical Div.	86
Potash Company of America	3
Powell, John & Co.	2nd Cover
Prentiss Drug & Chemical Co.	78
Private Brands, Inc.	113
Raymond Bag Co.	7
Raymond Division, Combustion Engineering, Inc.	9
Republic Chemical Corp.	122
Republic Steel Corp.	114
Riedeburg, Theodore Associates	133
Robertson Co., H. H.	Apr.
Rodgers Co., George G.	Mar.
Rohm & Haas Co.	106
Shell Chemical Co.	17, 126
Southeastern Clay Co.	Apr.
Southern Clays, Inc.	115
Southwest Potash Corp.	11
Spencer Chemical Co.	Apr.
Spraying Systems Co.	132
Standard Agricultural Chemicals, Inc.	79
Stauffer Chemical Co.	91
Sturtevant Mill Co.	118
Summit Mining Corp.	127
Tennessee Corp.	95
Texas Gulf Sulphur Co.	Apr.
Thayer Scale & Engineering Corp.	Apr.
Thompson, Friar M.	133
Tobacco By-Products & Chemical Corp.	82
Townsend, Dr. G. R.	Apr.
Union Bag & Paper Corp.	Apr.
Union Special Machine Co.	Apr.
Union Standard Equipment Co.	132
United Chemical Co.	Apr.
United Clay Mines	124
Universal Detergents, Inc.	102
U.S. Industrial Chemicals Co.	134, 4th Cover
U. S. Potash Co.	19
U. S. Steel Corp.	Mar.
U. S. Phosphoric Products Div., Tennessee Corp.	Apr.
Vanderbilt Co., R. T.	117
Velsicol Corp.	23
Virginia-Carolina Chemical Corp.	82
Vulcan Steel Container Co.	Apr.
Williams Patent Crusher & Pulverizer Co.	27
Willingham Little Stone Co.	Apr.
Willson Products, Inc.	125
Wisconsin Alumni Research Foundation	Apr.
Wolf's Agricultural Laboratories	133
Woodward & Dickerson, Inc.	128
Worthington Corp.	Mar.
Woudhuysen, H. L. & Associates	126
Wyandotte Chemical Corp.	100
Young Machinery Co.	123
Zonolite Co.	Apr.

## Tale Ends

WE have been called on the carpet for an item in our March issue in which we referred slightly to the telephone and pants-pressing facilities at Lake Tahoe, scene of last year's meeting of the Pacific Branch of ESA. Leslie M. Smith, secretary of the branch, points out that

Lake Tahoe was selected by the committee after long and careful consideration, and that its renowned scenic beauty, and other numerous advantages over congested, smog-ridden large cities, with their atmosphere of automobile exhaust fumes, etc. were considered to be ample compensation.

## Yes People read . . .



SURE, people read everywhere, but especially business people. And they read advertising, — not just for fun, but to keep informed on who's offering what, — to keep posted, up to date. That's why business magazines which are read by people looking to buy stuff, — are the most effective advertising media. And the business magazine which really is read in the field of agricultural chemicals is

## AGRICULTURAL CHEMICALS

175 FIFTH AVE.

NEW YORK 10, N. Y.

Member Audit Bureau of Circulations

There were, he indicates, many favorable comments from members who brought the wife and kids along and enjoyed a delightful vacation.

And, as for our query, "Where is Bend, Oregon?", scene of the coming 1954 meeting, June 22, 23 and 24, he tosses the answer right back at us. "Bend is located almost in the center of Oregon on U. S. Highway 97, at the intersection of highways from Seattle, San Francisco and Boise. In June, when coastal cities may have fog and rain, Bend has warm dry, sunny weather."

And, he points out, "Bend can be reached in a single day's travel by auto from Washington, most of California, Idaho and Nevada. Moreover the city is served by the Southern Pacific Railroad and United Airlines. In addition to the Pilot Butte Inn, convention headquarters, the city lists 35 hotels and motels. The Inn has just completed a brand new banquet hall which will accommodate our 450 members and guests at our annual banquet. Apparently, 'the boys who arrange these matters' really do their best to provide the greatest good for the greatest number."

After the short spell of shock we suffered from hearing a Californian admit there could be anything wrong with California weather . . . at any season of the year, we immediately dispatched a note to the folks at Pilot Butte Inn, asking them to reserve us a room, — handy to the electric telephone.

"Grub" Leonard demonstrates that retirement has its compensations. In a recent fishing session at Marathon, Fla. he subdued this handsome amberjack after a brief but spirited tussle. Mr. Leonard, shown on the right, in this informal pose, was quoted as saying "Boys, this beats the nicotine business six ways from Sunday." The amberjack had no comment.



# Bemis dress print cotton fertilizer bags...

## "the extra that pushes a sale <sup>your</sup> ~~our~~ way!"

Read this statement from Mr. Hugh Latimer, vice-president of the Supreme Feed & Fertilizer Co., of Philadelphia, Miss. It really tells the whole story . . . shows why YOU will benefit by packing YOUR fertilizer in Bemis Cotton Bags.

"We have noticed that an attractive Bemis Dress Print Bag can often be the extra that pushes a sale our way.

In most farm families, that piece of goods is a bargain that makes them happy and keeps them friendly."



Hugh Latimer, Vice-President  
Supreme Feed & Fertilizer Company



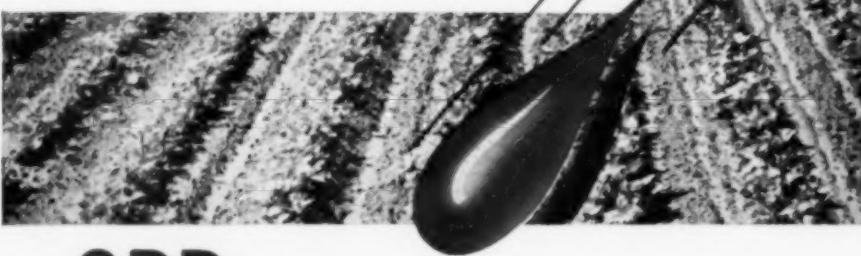
# Bemis

General Offices — St. Louis 2, Mo.  
Sales Offices in Principal Cities





**LET IT RAIN!**



## **...CPR kills insects Fast**

Rainfall as early as four to six hours after application of a CPR-based dust usually doesn't necessitate immediate redusting. CPR-based dusts and sprays provide extra fast kill — and are effective against the wide range of insects shown at right.

**No build-up of immunity** to CPR dust has ever been found — and this is proving an important consideration in the control of an increasing number of pests.

Formulate your crop dusts and sprays with CPR — the combination of piperonyl cyclonene, pyrethrins and rotenone gives you the product the extra power of synergism, with effectiveness on a wider range of insects. Yet CPR leaves no toxic residues — no special processes are needed to remove deposits as the washings ordinarily given fresh vegetables are sufficient. Operators don't have to wear respirators or special clothing.

### **Insects controlled by insecticides containing 20% CPR**

Asparagus beetle  
Saw flies  
Flea beetles  
Bean leaf beetles  
Cabbage worms  
Celery leaf tier  
Squash vine borer  
Blister beetle  
Ants web worms  
Blueberry maggots  
Blueberry fruit flies  
Imported cut worms  
Fruit worms  
Bean beetles  
Spotted cucumber beetles  
Thrips (except onion and gladioli)  
Pickle worms  
Colorado potato beetle  
Young horn worms  
Melon worms  
Potato aphids  
Harlequin bugs  
Corn earworms on beans

*For complete information about the formulation of dusts or sprays based on CPR—or about their use and where to buy them — write us today.*

Piperonyl **C**yclonene  
**P**yrethrins  
**R**otenone



**USTRIAL CHEMICALS CO.**

*Division of National Distillers Products Corporation*

**120 Broadway, New York 5, N. Y. Branches in Principal Cities.**

*In Canada: Natural Products Corporation, Toronto and Montreal.*

**RELY ON U.S.I.—For Pyrenone®—Rotenone—CPR Dust—Allethrin—CIPC and IPC Herbicides.**